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HIBBING WATERWORKS SYSTEM

Supply from Wells in Glacial Drift, Designed to Avoid Lowering of Ground Water Level—Electrically Operated Pumps with Remote Control—Trenching for Pipe Laying in Below-Zero Weather.

A waterworks plant has been completed at Hibbing, Minn., which contains some novel features, not the least of these being that a plant costing approximately half a million dollars has been built by a village of 12,000 population. Hibbing is said to be the largest village in the world, and also the richest, the assessed valuation being approximately \$80,000,000. This high valuation is due to the iron mining properties in the village, which constitute a large part of this valuation. The mining companies, in fact, are practically paying for the entire waterworks installation, and no bonds were issued against the village, but the work was paid for in village warrants.

down at any point below a certain level. This was accomplished by scattering the wells over a considerable area, and pumping them intermittently in regular rotation, thus permitting the water plane to rise at each well between pumpings and maintaining it practically at its original elevation over the entire collecting area of about 9 square miles.

The new supply is secured from eight wells of 30 to 36 inches in diameter, driven into the glacial drift to depths varying from 50 to 125 feet. These wells are from $\frac{1}{2}$ to $1\frac{1}{2}$ miles apart, and, as stated, are scattered over an area of 9 square miles. The water is raised from each well by a motor-driven centrifugal pump of Layne manu-



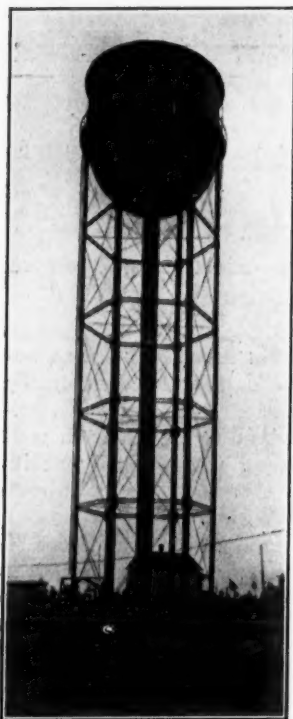
MILLION GALLON REINFORCED CONCRETE RESERVOIR UNDER CONSTRUCTION.

The old water supply of the village, which was obtained from wells, had become contaminated by mining operations, and the ground water level had been lowered by the draining of the iron mines. A contract was awarded for supplying 3,000,000 gallons of water per 24 hours, under a guarantee that unless this volume of water was made available the village would not be required to purchase the plant. It was also guaranteed that the water would be secured at a location free from mine drainage operation, and that its character would be approved by the state board of health. In order to insure the latter requirement, the state board made frequent analyses of the water as the work progressed. Another feature of the guarantee was an unusual one, but an important one in the development of deep well supplies, namely, that the water plane should not be drawn

factory, and a patented Layne screen was used at the bottom of the well casing. The diameters of the wells permit placing in them pumps of large capacity, one of them giving a discharge of over 1,000,000 gallons per 24 hours during a continuous 17-day test.

The water from the wells is pumped to a centrally located reinforced concrete reservoir of 1,000,000 gallon capacity through pipes of 8, 10 and 12-inch diameter. Adjoining the collecting reservoir is a main power house of brick and concrete construction with tile roof, in which are located four electrically operated pumps with a combined capacity of 5,000,000 gallons per 24 hours, which take water from the collecting reservoir and lift it against a head of 150 feet to an elevated tank. These pumps were manufactured by the Platt Iron Works, and are run with Westinghouse motors. Each of the eight

well pumps is provided with a remote-control electrically operated starter, and may be run all at one time or individually. The pumps have, under test, showed an efficiency as high as 72 per cent. They are so arranged that they can be operated in series, giving direct fire pressure when needed. All the water is delivered to the discharge mains through a Venturi meter.



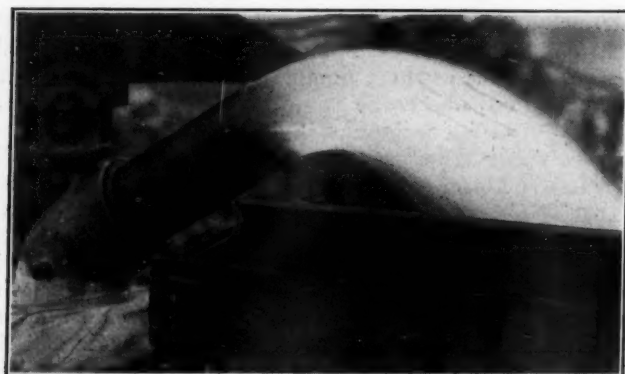
300,000 GALLON TANK ON
120 FT. STEEL TOWER.

The water is pumped into an elevated steel tank of 300,000 gallons capacity, and with hemispherical bottom, supported on a tower 120 feet high. It is provided with a cut-off valve electrically operated from the main station.

The power house is equipped with hot water heating plant, shower baths, and lockers, is of fireproof construction throughout. There is an overhead crane for handling machinery and heavy equipment.

The entire installation was constructed by Layne & Bowler Co., of Houston, Texas. The works were designed and supervised by Burns & McDonnell, of Kansas City, Mo., with R. J. Morehouse as resident engineer at Hibbing.

Some of the construction features are of special interest because of the extreme climatic conditions. Since the construction of the work began, there has been a variation in temperature from 100 degrees in the shade to 54 degrees below zero, the latter having occurred in January of this year. The pipe lines leading into the village are therefore laid at a depth of 10 feet to insure against freezing. Excavation of the trenches for these mains progressed throughout the winter without interruption, and in fact it was found that the freezing weather added to the economy of construction, since the frozen ground on top prevented the caving of the deep trenches. The country along the pipe lines was originally heavily timbered, and had been logged off and burned over, but a large number of partially burned logs had been left along the roadside. Each evening these logs were hauled to and scattered along the section of the line of trench that it was proposed to open the following day, and were burned there during the night. This so thawed out the ground that a



24-INCH WELL YIELDING 1,300 GALLONS PER MINUTE.

steam shovel could be used in excavating the top soil, the ground a short distance below the surface remaining just sufficiently frozen to prevent any difficulty from water or caving. During the summer weather this soil is more or less saturated with ground water, which would cause considerable trouble in the trench at such times. In addition to excavating most of the pipe lines, the steam shovel was used on the reinforced concrete reservoir also.

Another condition favorable to winter construction was the fact that during the winter months the mines are not operated full-handed, and the labor not employed in them was available for this work, which would not have been the case during the summer months. The actual construction time consumed on the entire work was 18 months.

CRACKS IN PAVEMENT FOUNDATIONS

Cracks in Pavements Caused by Shrinking of Clay Beneath—Repairing Such Cracks in Concrete, Brick and Bituminous Pavements.

By P. L. BROCKWAY.*

Wichita, Kansas, has about 25 square miles inside the corporate limits, of which about two-thirds lies in the valley of the Arkansas river, and the other third is on the higher ridge at the eastern limits of the valley, reached by streets having grades of from three to eight per cent on the hillsides. The general fall in the valley is approximately three feet to the mile, so that it is a rather difficult problem to make the minimum grade one-tenth of one per cent. This is too small to be entirely satisfactory from the standpoint of drainage, but even that requires frequent storm sewers across the valley emptying into the river and into a drainage canal, which parallels the river towards the east side of the valley. The ground is higher near the river than it is farther away, making this drainage scheme feasible. Valves in the sewers protect the business district from flood water in the river.

The entire valley is underlaid with sand at a depth of three to ten feet, and there is a well defined underflow of water at about ten feet. This makes almost perfect sub-drainage for pavement structures, and there has never been any trouble from this source. Geologically, the "Hill district," so called, is not so simple. I have seen a traction engine bury itself hopelessly in a pocket of fine sand pulling an elevating grader through a stiff clay bank. In general, the clay is of a chocolate brown shade under the black surface soil, becoming redder at shallow depths, and frequently containing nodules of soft gypsum. Occasional thin layers of solid gypsum stone with micaceous fragments require blasting. A thin sand stratum usually covers these solid ledges, and, where favorably located, contains seep water. These deposits are very irregular in size and depth. Only one water-bearing vein has been found in paving construction in a side-hill cut; this was successfully handled by depositing a layer of gravel under and behind the curb on the high side of the street, leading the water down to a catch basin at the lower end of the block.

The reddish brown clay readily absorbs water by capillary action in the winter and rainy seasons, but does not become unusually sticky or boggy. It is plastic enough in this condition to be readily moulded, and

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will stand up in the moulded shape. But when it is dried out at ordinary temperatures, 80 degrees to 90 degrees F., it shrinks twenty per cent. This was determined by laboratory experiment, tamping the moist clay in a foot-cube water tight box, drying it out and filling the cracks with water. In times of extreme drought such enormous shrinkage develops large cracks in the sub-soil, and the stresses set up split the overlying pavement in irregular jagged cracks which almost exactly coincide with those in the soil beneath. Curiously enough, these are nearly always almost parallel to the curb with occasional secondary transverse cracks. One has been observed running diagonally across an intersection, through bitulithic pavement, brick pavement in a street railway pavement with a twelve inch Portland concrete base, across the bituminous pavement on the other side of the track, through the concrete curb and gutter and into the earth parking beyond, the only part of the whole structure not broken being the steel rails in the railway track. Some of the cracks attain a maximum width of over an inch. Sometimes there is a difference of elevation of half an inch to an inch in the pavement on the two sides of the crack, but fortunately not often.

The present record-breaking drought (no rain for seven weeks when this was written, Aug. 15th), with an average maximum daily high temperature of 93.4 degrees reported by the weather bureau for the month of July, and somewhat higher for August, is giving one of the worst examples of the destructive action of this shrinkage that we have ever experienced. Temperatures as high as 145 degrees F. have been found by actual test to exist in a brick pavement, with the temperatures of dry dust averaging 7 degrees F. higher than in the adjacent brick pavement. Comparatively very little trouble has arisen from expansion, but, on the contrary, a number of old minor longitudinal cracks have widened in opposition to the temperature expansion.

There is very little difference in the number of cracks in different parts of the pavement in so far as the location transversely is concerned. They are just as apt to occur within three or four feet of the edge of the pavement as the quarter or the crown of the street.

In general the bituminous-top pavements have hammered down into the cracks and followed the uneven settlement of the base on the two sides of the crack without actual fracture because of the prevailing high temperature at the time.

Cracks in concrete pavement are the most unsightly and hardest to repair.

In brick pavement with asphaltic filler on a sand cushion, the sand runs into the crack, allowing the brick to settle, sometimes over an inch or practically the whole depth of the sand cushion. With grout filler, the pavement bridges the depression without fracture, but heavy traffic would break it up. Under the comparatively light traffic on the streets, the only sign of stress so far observed, is a chipping of the mortar in the top of the interstices between the bricks.

As to repairs, the open cracks in the bituminous pavement have been sealed with asphaltic cement.

The same method has been used to seal the cracks in concrete pavement, hot sand being run into the crack where it is wide enough. This is not entirely successful, as succeeding hot, dry weather runs the asphaltic cement out into the crack below.

Brick pavement with asphaltic filler is successfully repaired by taking up the depressed brick, mixing a small amount of cement with the sand cushion to make it into a mortar to prevent it running out again, and relaying and refilling the brick.

An experimental stretch of pavement was laid especially designed to prevent cracking. One half was laid with triangular mesh reinforcement in the base, with the heavy wires across the pavement; the other half was laid with a four-inch layer of sand under the base. Both methods were entirely successful. Under existing local market conditions the extra excavation and sand fill is cheaper.

This method is being strongly recommended to property owners (who have the initiative in naming the kind of pavement under our paving laws) for concrete pavement.

It is cheaper to repair brick pavement than to use the precaution against cracks, and the repair seems to be reasonably permanent.

PAVEMENT OBSTRUCTIONS

Manhole Covers, Cross-Gutters, Posts and Poles, Letter, Fire and Police Alarm Boxes, Fire Hydrants, Litter Cans, Awnings, Packing Boxes.

In addition to driveways across sidewalks, there are found in most cities breaks in the uniformity of sidewalk surfaces in the form of cover plates to manholes, valve and meter boxes and other openings in the sidewalk. There is no reason whatever why any of these should be allowed to protrude above the level of the sidewalk, and yet millions can be found in the country rising from 1 inch to even 3 or 4 inches above the sidewalk level. The United States government maintains such a nuisance in one of the busiest sidewalks in the world, in the form of a large square cover to a vault opening raised 3 or 4 inches above the sidewalk of Broadway in front of the post-office. Up to a year or two ago a saloon on 23rd street was allowed to maintain eight coal holes in the middle of the sidewalk protruding more than an inch above the surface of the same; and similar instances could be found by the thousands in almost any large city and probably by the score in most small ones. Such projections would not be permitted in the adjoining roadway surface, and the city officials should have as much consideration for the pedestrians who use the sidewalk by the thousand as for the vehicles which use the roadway by the dozens.

These manhole covers not only should have their surface flush with that of the sidewalk (and this means that their tops must be flat, and not crowned or mushroomed as many of them are), but the top surface should also be rough enough to avoid being slippery but not enough so to be inconvenient to walk on. A cover with its top formed of pyramids $\frac{1}{8}$ to $\frac{1}{4}$ of an inch high and $\frac{1}{4}$ to $\frac{3}{8}$ of an inch square at the base, the bases touching and the grooves between the pyramids being continuous, will give just about enough roughness to avoid being slippery until the pyramids have been worn down half their depth, while the continuous grooves will catch a minimum amount of dirt and permit easy cleaning with a broom. Another form of covering which is not generally so durable but is even more comfortable for walking is one with a pan-shaped depression about 2 inches deep over the entire surface except the rim, the depressed part being filled with Portland cement mortar, well compacted and given a regular sidewalk finish. It is well to make no provision for raising any of these covers from above, but they should be removable only by lifting from below; otherwise burglars or others might use them for unauthorized access to the building.

The tops of storm water inlets, when set in the sidewalk pavement, are generally most satisfactory from the points of view of both appearance and convenience to

pedestrians when made of the same materials as the sidewalk—generally concrete or stone. In some cases, however, when the sidewalk is paved with stone flagging, stone of the same kind can not be obtained of sufficient thickness, or is not sufficiently hard and tough to permit the edge of the inlet top to serve as a curb; then another kind of stone or perhaps concrete may be used and is preferable to iron. Where there is a sodded strip around the inlet top, however, cast iron, which is generally smaller and less obtrusive than stone or concrete, is more satisfactory.

Rain water led from roofs by leaders is best discharged into storm sewers, where there are any, by underground pipes. Where there are no storm sewers (house sewers should not be used), the gutters seem to be the only alternative. A 4-inch pipe is probably the largest which can be used for carrying the roof water under the sidewalk to the gutter. These pipes are apt to freeze shut in winter in northern climates, and to clog with dirt in all seasons and sections. As an alternative, sidewalk cross-gutters are often used, either open or closed. The former consist of depressions from $\frac{1}{2}$ inch to 2 inches deep, which will carry the run-off from light showers but are of little avail in heavy rains. They also are somewhat of an inconvenience to pedestrians. Both objections are to a large extent met by the larger covered gutter. This is made 4 to 6 inches deep and wide, with vertical or nearly vertical sides, and is covered with an iron plate. The gutter itself is sometimes a cast iron trough set in the ground; but one of concrete is probably more common. The cover plate is generally of cast iron in two or more sections, and sets flush with the sidewalk. If one of these gutters becomes choked with dirt or ice it can be cleaned by removing the cover plates. If the gutter or trough be made narrower at bottom than at top, ice can be removed more readily. The chief objection lies in the possibility that the cover plates will be broken or dislodged. They should be strong enough to avoid the former, and to prevent the latter should be provided with lugs at the sides projecting down into the gutter.

Other obstructions, found to a greater or less extent in most cities, exist in the form of posts and poles of all kinds, fire hydrants, litter cans, and other features of a more or less public nature. So long as telegraph, telephone, lighting, and trolley wires are carried in the air, and street lights are placed there, and until it becomes the practice to place litter cans, letter boxes, fire and police signal boxes, etc., on private buildings or fences, and fire hydrants either there or underground, such obstructions seem to be necessary. But much can be done to minimize the inconvenience caused by them and their unsightliness. Where they are along the curb, they should be placed as near to this as is consistent with safety against wheel hubs, which means that no hydrant nozzle or other part of such obstruction at the elevation of any wheel hubs in common use should be nearer to the curb face than 6 or 8 inches. At corners, none of these obstructions should be placed in that area of the sidewalk between the curb intersection and the street (property) lines extended, unless perhaps one post at the curb corner. Even this location is somewhat objectionable, but seems almost necessary in some cases for supporting street lights or trolley span wires.

The number of poles in a street can in many cases be greatly reduced. All companies stringing wires can be required to use the same set of poles, and in some cases street lights, supported by either bracket or mast arm, can use the same poles; the same spacing will not always, however, suit both purposes. Poles for supporting trolley span wires have sometimes been extended higher and used for telegraph and telephone wires also, but there are practical objections to this.



Courtesy E. L. Marek.

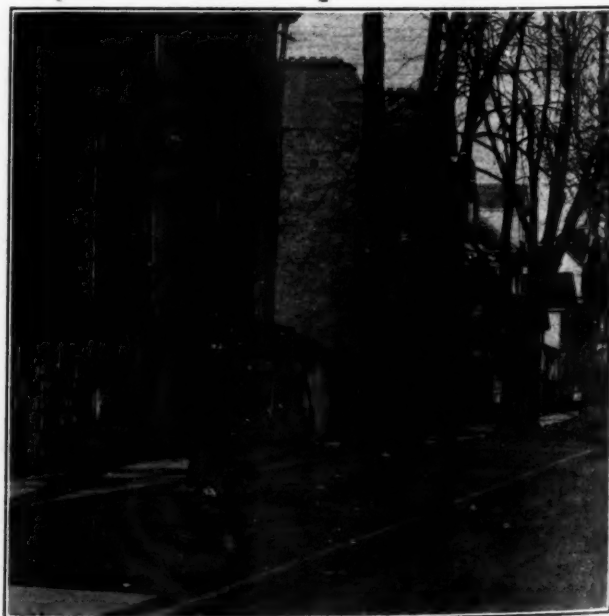
SELF-SUPPORTING AWNING IN SAN ANTONIO.



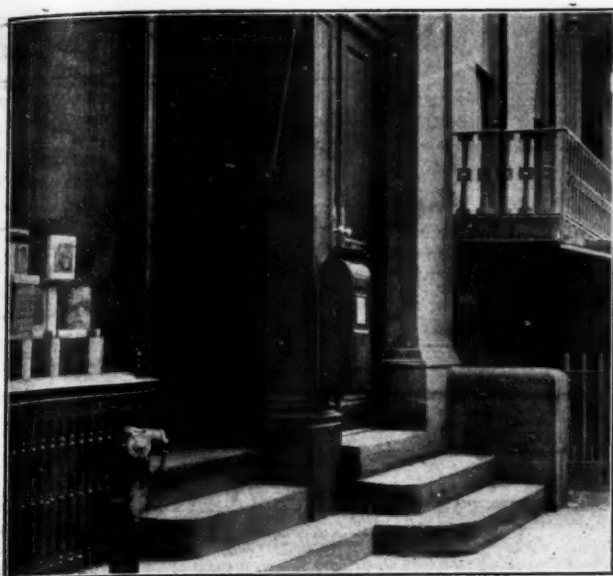
STREET DISFIGURED BY AWNINGS.
Regent Street, London.

Given these poles, there seems to be no good reason why letter boxes and fire and police alarm boxes should not be fastened to them. Street-name signs also can be placed on such poles where there are any at the street corner; otherwise it may be desirable to erect a short pole at the curb intersection for the purpose.

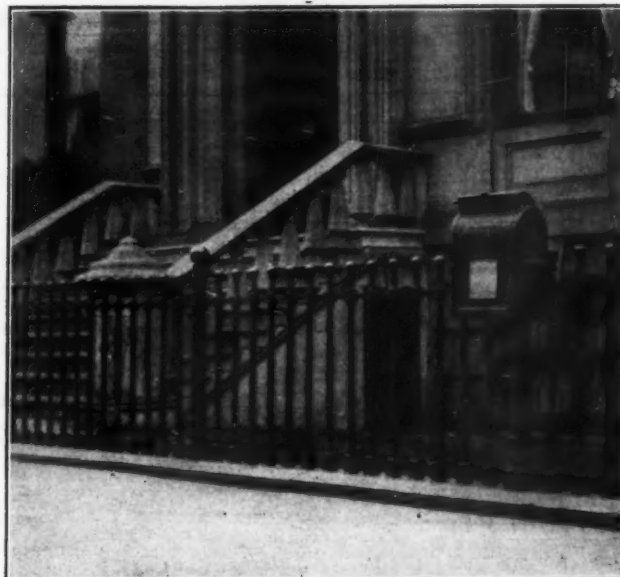
Where there are no poles it would seem to be unnecessary to place posts for letter and police alarm boxes.



Courtesy U. S. Wood Preserving Co.



LETTER BOX ON BUILDING.



LETTER BOX ON FENCE.



LETTER BOX ON OLD GAS LAMP POST.

A LIGHT STEEL STANDARD AT THE CURB INTERSECTION IS THE ONLY OBSTRUCTION AT THE MANISTEE STREET CORNER SHOWN IN THE ILLUSTRATION AT THE RIGHT. TO THIS IS ATTACHED A WIRE RECEPTACLE FOR PAPERS AND OTHER SMALL TRASH.



Courtesy Warren Bros. Co.
TRASH RECEPTACLE ON ELECTRIC LIGHT POLE.

AT THE TOP OF THE PAGE ARE SHOWN LETTER BOXES PLACED ON BUILDING AND FENCE RATHER THAN AT THE CURB LINE. IMMEDIATELY ABOVE, AN OLD GAS LAMP POST OBSTRUCTS THE CROSSING; LETTER BOX MIGHT BETTER BE PLACED ON NEW LAMP POST, WHICH SUPPORTS STREET-NAME SIGNS. ON THE OPPOSITE PAGE IS ILLUSTRATED DISADVANTAGE OF PLACING TREES TOO NEAR THE STREET LINE. APPARENTLY STREET WOULD BE IMPROVED BY PAVING BETWEEN TREES AND CURB ALSO.

IN THE CORNER SHOWN AT THE RIGHT, THE CURB CORNER, IF NOT ROUNDED, WOULD EXTEND TO THE POINT A, GREATLY REDUCING THE AMOUNT OF VEHICULAR TRAFFIC WHICH COULD PASS THE CORNER.



ROUNDING SIDEWALK CORNER AT INTERSECTION OF MAIN TRAFFIC STREETS.

but these can be attached to buildings or fences at convenient points. Ordinarily little difficulty is experienced in obtaining permission of private owners to do this. If there is such difficulty, a simple post (say of angle or T iron) can be placed for this purpose an inch outside the building line.

Large litter cans or trash receptacles are perhaps best placed along the property line also, or in the sodded or planting strip along the curb where there is one. Ordinarily, however, each one should be located with special consideration of local conditions—where there are likely to be the most papers, fruit skins, etc., to be thrown away, as in front of the post office, near fruit stands and the like; but also where they will least inconvenience pedestrian traffic. Some cities use as litter receptacles small cans (as in Washington, D. C.) or wire baskets (as in Manistee, Mich.), fastened to telegraph or electric light posts.

More seriously obstructive of the sidewalk are numerous kinds of structures and materials placed by abutting owners, aside from extensions of the buildings themselves onto public land. Among these are awnings. In a great many cases the awnings themselves are so low as to inconvenience pedestrians of even average height, while tall ones or those carrying umbrellas can not walk under them at all. A minimum height should be prescribed by law and enforced. It would add to the appearance of the street if uniformity of height, width and pitch could be enforced also. How a street may be disfigured by numerous awnings of various heights and angles is seen by the photograph of Regent street, London. Permanent awnings of wood or metal supported by posts at the side away from the building are common in some cities. These afford to pedestrians shelter from sun and rain and are generally abundantly high; but the posts should be kept small and out at the curb line so as not to obstruct the sidewalk. Hotels and theatres are the most common offenders in this respect, some using heavy masonry columns to support elaborate roofs over the sidewalks. Better than using even light iron posts is it to support the awnings from the buildings, either from below by brackets or from above by rods or chains.

Temporary obstruction of sidewalks by boxes, crates and other forms of freighted goods may not appear to be a matter of street construction, but in a sense it is. For the merchants must receive or send off goods, and to do so must transfer them from store to vehicle. If the street offers the only route by which vehicles can reach a building, then the goods must be carried across the sidewalks. If paved alleys were carried through the center of each block, giving access to the rear of each store, this use of the sidewalk could be prevented. This is perhaps the strongest argument for alleys in the business part of a city.

The sidewalk itself may be an obstruction to the roadway traffic, as at corners, where sharp curb intersections should be rounded to permit vehicles to turn the corner from and to the part of the roadway near the curb. The accompanying photograph, on which have been drawn the lines of the curb carried to an angular intersection, show how greatly traffic is inconvenienced by rounding the curb intersection with a long-radius curve.

DELINEATING STREET CROSSINGS.

A method of regulating the crossing of roadways by pedestrians at street intersections, which was adopted several months ago in New York city, is spreading quite generally throughout the country and would therefore appear to be productive of desirable results in preventing accidents at these points. The plan consists in outlining the roadway crossing by two lines of white paint, one a continuation of the curb line carried across the roadway;

the other parallel to the first and 10 feet or more distant from it. Pedestrians are supposed to cross the roadway only between these lines, and vehicles are required to stop at the outside line when traffic in that direction is held up by the traffic police. In Philadelphia a Lucas paint which dries in a half-hour is being used and is found to last six weeks or more. Other paints tried before this were not found to be sufficiently durable.

In Trenton and Long Branch, N. J., additional crossings for pedestrians are provided in the middle of each long block, a width of about 10 feet across the roadway being marked off by white lines, with the word "X walk" painted at each end of the strip. Also, a space 10 feet each way is marked off around each fire hydrant, with a notice to traffic not to stop within this area. In Trenton, white-wash is used for marking the roadway.

CONCRETING IN FREEZING WEATHER

Possible if Proper Precautions Are Observed—Heating Aggregates and Water, Forms and Reinforcement—Testing for Frozen Concrete.

Carrying on construction work during cold weather may not seem to be a timely topic; but contractors must generally plan their work some weeks or months ahead, and it is not too soon to consider whether work will be closed down in ten or twelve weeks, or be continued through the winter; or whether new work will be begun with a view to continuing it into freezing weather. Almost any kind of work can be done in winter weather and good results secured, if sufficient precaution be taken. Such precautions increase the cost more or less and most out-door work is subject to more or less frequent interruptions by snow storms; but on the other hand, labor may be more abundant and cheaper, early completion may bring higher prices, and it is desirable to keep an efficient organization together.

Several times during the past two or three years we have described with greater or less detail methods employed in winter work on trenching, constructing concrete bridge piers, buildings, sewers, etc., and some other classes of work. One contractor, for instance, erected a good-sized tent over the site where a bridge pier was to be built and kept it there, with a small stove to furnish heat, during the entire work of construction. Several contractors report that they have found trenching in winter cheaper than in summer under certain conditions, the frozen top of the ground preventing caving and thus making unnecessary the use of sheathing and bracing which would have cost more than the extra cost of digging out the frozen soil. If there is quicksand in the trench, by leaving this exposed to a temperature considerably below freezing over night (but not with water flowing over it) it may be frozen and can be handled the next day with much less difficulty.

Several suggestions for conducting concrete work in freezing weather are offered by the Portland Cement Association, from which we abstract the following:

The necessary conditions are that the fine and coarse aggregates and the water used in the concrete be heated to a certain minimum temperature, and that the concrete then be placed quickly and the heat maintained until the first hardening has been completed.

During the first few days following the placing of concrete, alternate freezing and thawing at comparatively short intervals will damage it.

Salt added to the mixing water lowers its freezing point, but does not supply heat or warmth. It delays the hardening of the concrete and therefore increases the

length of the period during which there is danger in freezing.

Aggregates and mixing water must be heated so that the concrete, when placed, has a temperature of 75° or 80°. The cement forms such a relatively small part of the mixture that it is not necessary to heat it.

Some sands and some gravels and stones are injured by too much heat. As a general rule it is well not to heat the aggregates above 150°.

To have the concrete warm when placed, it should be used immediately. Metal forms and reinforcing should be warmed and all ice, snow and frozen dirt removed from them. They can be warmed by turning a jet of steam against them or by wetting with hot water.

Even with these precautions, the temperature of concrete will lower more or less rapidly, depending on the air temperature, and on the area of concrete surface exposed to the air. To delay cooling, cover with canvas, hay or straw, house in the work or take other precautions against direct contact of free, cold air with concrete. If there is a structure over the concrete, a small oil or coke-burning stove or salamanders may be used. Apply the protection as soon as the concrete is placed.

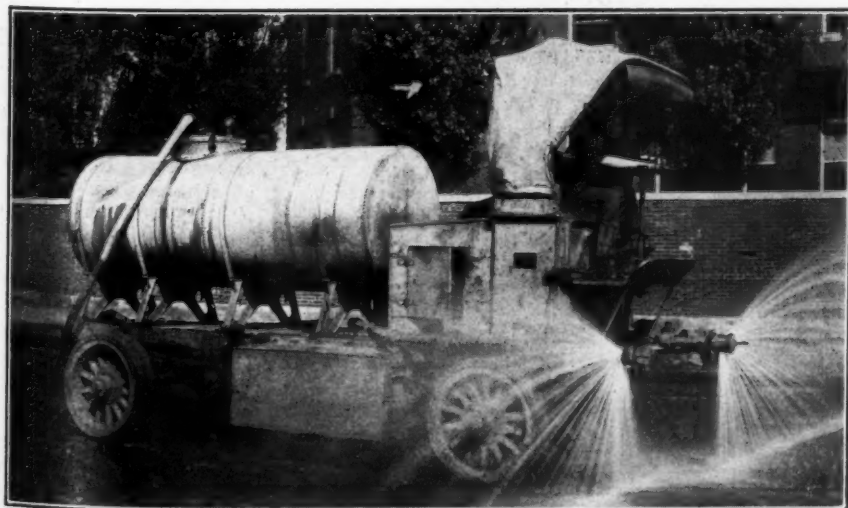
Temperatures which will not freeze concrete may delay its hardening for a considerable time. In very cold weather the protection of the concrete should be continued for at least five days.

Frozen concrete sometimes very closely resembles that which has thoroughly set, ringing like it when struck with a hammer. Be sure it has set before removing forms. To determine this, remove a small unit of the form (as one board) and pour hot water on the concrete or turn on it a jet of steam or the flame of a plumber's torch. If the concrete softens, it is frozen.

Even though concrete has been frozen before early hardening was completed, it may afterwards set properly if not again frozen after the first thawing out. But prevention of freezing at all is safest and best.

ELECTRIC STREET SPRINKLERS IN BOSTON

Six electric sprinkler wagons are used in sprinkling Boston's streets, consisting of a 3.5 ton G. V. chassis, with an 800-gallon tank mounted thereon. Contrary to usual construction of sprinklers, the sprinkler heads are in the front of the vehicle instead of at the back. This permits closer gauging of distances between areas to be watered and the sidewalks on which people may be passing, and enables the driver to control the flow so as to avoid spattering pedestrians at crossings.



ELECTRIC STREET SPRINKLER USED IN BOSTON.

The battery equipment is the Exide "ironclad," and the charging of batteries is done by the Edison Electric Illuminating Co. under its battery exchange system, under which the user of a truck is charged on a mileage basis for batteries furnished charged, the battery equipment being the property of the Edison Company.

VACUUM STREET CLEANING IN ST. LOUIS

Report of City Official on Two Months' Test—Character and Amount of Work Done—Cost—Advantages and Disadvantages.

The Street Division of the Department of Streets and Sewers of St. Louis, Mo., has made a sixty-day test of a vacuum street cleaner, two machines having been operated during that time by the manufacturers under the direction of the department. One of these machines was used for cleaning the gutters only, the other (called the patrol machine) for cleaning the rest of the street. (This apparatus was described in "New Appliances" column of August 13th, 1914.)

During the period of the test the machines and their work were closely observed by C. M. Talbert, Director of Streets and Sewers, who reported as follows:

Close observations have been made of the work of these machines and some conclusions made on their advantages and disadvantages and a comparison of the cost of the work under this system with the old method that has been in use for some years past was made. Among the things which can be said in favor of the work of the machines is:

First. A very complete removal from the street surface of all foreign matter and particularly what is known among those who study street refuse as "dust," this being the very fine and at times impalpable particles which lie close to the surface of the pavement and which has been found by bacteriologists to be the germ carrying part of street refuse.

Second. By cleaning these streets every night the department has been enabled to entirely eliminate street sprinkling as a practice. There has not been on the streets of the downtown section any street sprinkling since about the first day of July. These street sprinklers make from six to eight trips each business day over each of the downtown streets and from the very nature of their work, that is, their very slow movement and the fact that they must take the center of the street in order to properly cover the surface, complicate the traffic problem.

Third. This absence of the street sprinkler leaves a dry, clean surface for traffic and in these days when probably seventy-five percent of the traffic is automobiles, it adds greatly to the safety by eliminating the tendency to skid; the report of the police and others interested in traffic shows that there has been a great diminution of accidents from such causes during the past thirty days. There must also be considered the general inconvenience to pedestrians from water from the sprinkler sprays.

Fourth. As would naturally be expected, the use of the vacuum system has materially reduced the labor necessary to keep clean the sewer inlets and catch basins. The superintendent of sewers reports a reduction in material removed of about thirty-five per cent. This proportion will be increased still further as the system becomes established and it is anticipated that the expense of cleaning sewer inlets will be reduced about fifty per cent. It has also very materially reduced the number of complaints of stopped or blocked sewers.

Fifth. From an examination of material taken from the streets, it does not appear that the asphalt surfaces are sensibly worn by the brooms.

Sixth. The more complete removal of dust and dirt from the streets reduces, of course, the work of the white wings and while they have not been reduced in number during the experimental period, it is certain that if a permanent arrangement is entered into, some reduction will be made in their number. It will always be necessary, of course, in any system of street cleaning, to have white wings in the congested district during the business hours.

Among the disadvantages is the inability to use the machine under any other conditions than when the roadway or gutter is perfectly dry. During our experimental run of sixty days there have been six nights on which work could not be successfully done. It would appear to me likely that during the rainy season, that is from the middle of March to the first of June, it would be necessary to use some form of street flushing at least twice per week. This is largely a matter of guess, as no two seasons are at all alike. There have been periods wherein the vacuum cleaner could undoubtedly be used a good portion of the time even in the months of March, which is one of the most troublesome months on account of the prevalent high winds. It must be borne in mind, of course, that the same rain that would stop the work of the vacuum cleaner would have a tendency to wash the dust into the sewer, or if not heavy enough for that, to eliminate it through a natural sprinkling.

The owners of the machines desire to enter into a contract with the city at a rate per great square (10,000 square feet) of surface cleaned, and have refused to sell or lease any of the machines, basing their refusal upon their claim that they are more interested than anyone else in the success of the machine and that their men are trained especially for this work; that failures in other machines of like character that have been placed upon the market from time to time have been largely due to placing their operations under men who are not vitally interested in their success.

I do not believe as a general proposition that any municipality should contract through a public letting with the lowest bidder for the cleaning of its highways, as, from the very nature of the work, it is extremely difficult to have it properly carried out unless the contractor himself enters into the contract with the idea of giving the best possible results. I do believe, however, that with the proper selection of machines and contractor, and allowing a fair sum for the work to be done, the city could enter into such an agreement without being detrimental to its own interests.

The owners of the machine, namely the Way-Cleanse Company of Sandusky, Ohio, propose to the city to keep the two machines now in use on the public streets for the remainder of the fiscal year, approximately eight months, providing the city will pay to them: eighty cents per great square (10,000 square feet) of street cleaned; payment to be made on such areas as are actually cleaned, that is, no payment to be made for days when work for any reason whatsoever cannot be done.

At the present time we are cleaning approximately 174

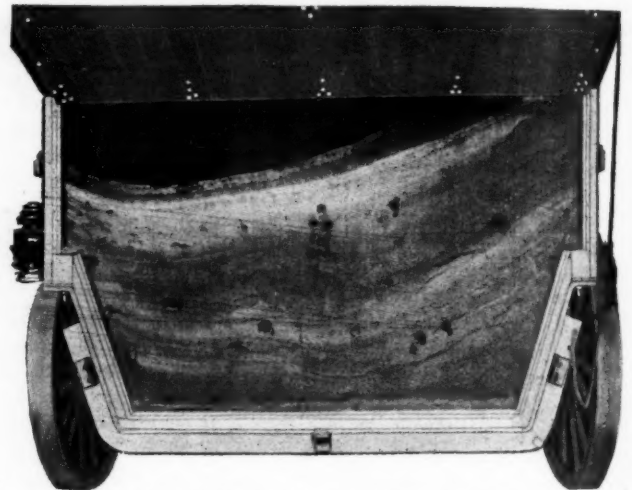
great squares. The approximate cost to clean 174 great squares at eighty cents would be \$140. Assuming 120 days of work for the remainder of the fiscal year, we have \$16,800, which equals the cost for cleaning the entire district six nights per week during favorable weather for the remainder of the year.

As against this payment, to clean the streets during this period by our ordinary process of flushing once each week, the cost would be 34 times \$124, or \$4,216, or a net increase in cost to the street division of \$12,600.

To be credited against this net increase:

Reduction in crews picking up papers, etc.....	\$1,800.00
Withdrawal of sprinkling taxes for eight months (reversion to municipal revenue).....	4,000.00
Cost of water for sprinkling and flushing.....	1,500.00
Saving in inlet cleaning.....	400.00

Totals	\$7,700.00
Leaving a net increase of municipal expense for this cleaning of.....	\$4,900.00



DIRT IN COLLECTING CART, REMOVED FROM A STRIP EXTENDING NINE FEET FROM THE CURB, 140 CITY BLOCKS LONG.

In conclusion it may be said that during this period since the sprinkling wagons have been removed and the vacuum cleaning instituted, there have been no complaints of dust or dirt in the congested district and this department has received numerous verbal commendations upon the changed conditions as well as having on file a number of letters from merchants stating that conditions so far as dust is concerned have been improved.

It would seem that with the present financial condition of the street division an additional appropriation of \$5,000 will be necessary, the department being able to take care of the remaining \$7,900 additional cost through the appropriation for street cleaning.

In view of all the enumerated conditions, it is the opinion of the department that it would be possible for the city to enter into such a contract as outlined with the Way-Cleanse Company, and it is requested that it be allowed to do so with the understanding that an additional appropriation of \$5,000 be allowed through the Board of Estimate.

(It should be noted that, in the above, the cost of 34 flushings in eight months is compared with that of 120 vacuum cleanings; and that 120 flushings, plus paper collection and additional inlet cleaning would apparently total \$17,080, or more than the cost of vacuum cleaning, with no allowance made for the water consumed.)



DIRT COLLECTED FROM 242 CITY BLOCKS, JUNE 1, 2 & 3.
Note that considerable paper is picked up with the dust.

The company's records show that during the 61 days of June and July the sweepers, cleaning 140 city blocks, worked every day except the nine Sundays, and June 5, 6, 7, 9 and 22, the gutter machine, however, working on the 9th. On the 3rd it rained until 9 p. m., but the machines started at 1:30 a. m. On July 12th it rained from 4 to 6 p. m., the machines started cleaning at 8:15 p. m. On July 19th there was a heavy rainfall of .81

of an inch from 2 to 3 p. m.; the machines started cleaning at 7:30 p. m. The average amount of dust picked up per cleaning in June was 6.04 cu. yds, or 10,268 pounds; and in July, 5.77 cu. yds., or 9,809 pounds. Of the total amount picked up, 282.95 cu. yds., 161.18 cu. yds. was by the gutter machine, and 121.77 by the center machine. The following figures are given as the cubic yards removed by suction sweeper on the several days:

Cubic Yards Collected Each Day During Two Months Test.

Week beginning	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
May 29th	5	.....	.....	5.17	5.90	6.48	17.55
June 5th	Rain	Rain	Rain	8.86	3.37*	3.90	16.13
" 12th	9.16	7.54	5.10	6.36	5.26	5.56	38.98
" 19th	7.56	5.86	6.74	Rain	6.10	5.36	31.62
" 26th	7.47	5.69	5.96	5.10	4.48	5.26	33.96
July 3rd	5.87	6.11	3.56	4.48	5.26	5.26	30.54
" 10th	5.96	6.74	7.33	6.28	7.38	5.83	39.52
" 17th	6.06	6.29	5.69	7.16	5.24	4.81	35.25
" 24th	5.08	6.40	6.47	3.93	5.38	5.38	32.64
" 31st	6.76	.....	...	...	...	...	6.76
Average	6.74	6.23	5.84	5.92	5.37	5.32	5.89

*Gutter machine only working.

HAND DRAWN FIRE APPARATUS

NUMBERS IN SERVICE IN THREE HUNDRED CITIES, AS REPORTED BY FIRE CHIEFS.

City.	Hose Reels.	Hose Carts.	Hose Wagons.	Hook & Ladder Carts or Truck.	Chemical Wagons.	Pumping Engines.	City.	Hose Reels.	Hose Carts.	Hose Wagons.	Hook & Ladder Carts or Truck.	Chemical Wagons.	Pumping Engines.
Alabama:							Illinois (Continued):						
Enterprise	123	...	...	...	...	...	Lincoln	1433	...	...	1	...	1
Tuskegee	...	...	...	...	...	...	Marshall	...	...	...	...	...	...
Union Springs	...	5	...	1	...	1	Naperville	...	...	...	...	...	...
Arizona:							Normal	...	...	...	...	...	...
Bisbee	3	...	...	...	1	...	Pana	...	...	...	...	...	...
Douglas	323	...	...	...	...	...	Paris	...	...	...	...	...	...
Nogales	3	...	...	1	1	...	Paxton	...	...	...	...	...	...
Prescott	...	...	2	...	...	...	Rochelle	...	1	...	...	...	...
Yuma	6	...	...	1	1	...	Watseka	...	...	...	1	1	...
Arkansas:							Indiana:						
Morrilton	3	...	...	1	...	...	Attica	31	...	...	...	...	...
Prescott	2	...	...	...	...	...	Batesville	1	...	1	1	...	1
Siloam Spgs.	...	3	...	...	...	...	Decatur	...	1	...	...	...	...
California:							Garrett	...	...	...	...	...	...
Hanford	1	...	...	1	...	...	North Manchester	1	...	...	...	...	...
Hayward	12	...	...	1	...	...	Plymouth	...	...	...	1	...	...
Los Angeles	13	...	...	...	6	...	Sullivan	1	...	...	...	...	...
Napa	12	...	...	1	...	...	Iowa:						
Oxnard	3	...	...	1	1	...	Chariton	...	...	...	...	1	...
Petaluma	4	...	...	1	...	...	Cherokee	...	1	...	...	...	...
San Leandro	2	...	...	...	...	...	Cresco	...	2	...	...	6	...
San Rafael	...	...	1	2	...	...	Ft. Dodge	3	...	...	...	...	...
Santa Ana	2	...	...	1	...	...	New Hampton	...	...	...	1	1	...
Santa Barbara	3	...	...	...	...	...	Valley Junction	...	...	...	...	...	...
Santa Monica	1	...	...	...	...	...	Kansas:						
Vallejo	4	...	...	1	...	...	El Dorado	...	...	...	...	...	...
Colorado:							Fredonia	...	...	...	...	...	...
Canon	2	...	...	...	...	...	Frontenac	...	...	...	...	...	...
Durango	21	...	...	...	...	...	Horton	...	...	...	1	...	...
Leadville	1	...	...	...	...	...	Iola	...	1	...	...	...	...
Longmont	...	...	...	1	...	...	Manhattan	...	1	...	...	...	...
Connecticut:							Mulberry	...	...	...	...	...	...
Ansonia	3	...	...	...	...	...	Olathe	1	...	...	...	...	...
Greenwich	1	...	...	...	...	...	Osawatimie	...	1	...	...	...	...
Norwich	1	...	...	...	...	...	Winfield	...	...	...	1	...	...
Suffield	2	...	...	1	...	...	Kentucky:						
Thomaston	3	...	...	...	1	...	Cynthiana	3	...	...	1	...	...
Windsor	...	...	...	...	1	...	Franklin	...	...	...	...	...	...
District of Columbia:							Glasgow	...	...	...	...	...	...
Washington	2	...	...	...	...	...	Louisiana:						
Florida:							Hammond	2	...	...	1	2	...
Daytona	...	1	...	...	2	...	Thibodaux	...	...	...	...	...	...
Ft. Myers	...	...	...	1	...	1	Morgan City	...	...	...	1	...	...
St. Petersburg	...	...	...	...	1	1	Maine:						
Sarasota	3	...	...	1	1	...	Eden	2	...	...	...	...	...
Georgia:							Fairfield	4	...	...	...	...	...
Douglas	2	...	...	...	...	...	Sanford	3	...	...	...	...	...
Elberton	1	...	...	...	...	...	So. Paris	...	5	...	1	...	...
Idaho:							Winslow	1	...	...	...	...	...
Lewiston	6	...	...	...	...	...	Maryland:						
Nampa	2	...	...	...	...	...	Annapolis	1	...	...	...	...	...
Sand Point	1	...	...	...	1	...	Cumberland	...	...	...	...	...	...
Illinois:							Easton	...	...	...	1	...	...
Centralla	1	...	...	...	...	...	Salisbury	2	...	...	...	...	...
Chester	3	...	...	...	...	...	Massachusetts:						
E. Moline	1	...	...	...	...	...	Attleboro	2	...	...	1	...	...
E. St. Louis	1	...	...	...	...	...	Easthampton	...	...	2	...	...	...
Edwardsville	...	...	...	1	...	...	Gloucester	...	...	...	...	...	1
Fairbury	...	2	...	...	1	...	Greenfield	...	...	...	...	...	...
Fairfield	2	...	...	...	2	...	Orange	...	...	...	...	2	...
Forest Park	...	4	...	...	...	...	Peabody	...	...	...	...	...	...
							Reading	...	...	...	...	...	...

HAND-DRAWN FIRE APPARATUS IN THREE HUNDRED CITIES.

City.	Hose Reels.	Hose Carts.	Hose Wagons.	Hook & Ladder Carts or Trucks.	Chemical Wagons.	Pumping Engines.	City.	Hose Reels.	Hose Carts.	Hose Wagons.	Hook & Ladder Carts or Trucks.	Chemical Wagons.	Pumping Engines.
Massachusetts (Continued):							Oregon (Continued):						
Taunton	2	...	...	...	6 ²	...	Medford	...	...	...	1	2	...
Tewkesbury	1	...	...	...	...	...	Portland	14	...	...	...	...	...
Wellesley	1	...	...	...	4	...	Roseburg	...	4	...	...	...	...
Williamstown	4	...	...	...	...	...	Pennsylvania:						
Winthrop	1	...	...	...	...	...	Beaver	1	...	...	...	...	...
Michigan:							Bellevue	...	2	...	...	...	...
Bessemer	...	1	...	1	...	...	Bellewood	2(1)	...	...	1	...	...
Crystal Falls	2	...	...	...	...	...	Bongo	3	...	...	...	...	...
Hillsdale	2	...	...	...	...	...	Brookville	3	...	...	...	...	...
Marion	...	2	...	...	...	...	Connellsville	...	...	1	...	...	...
Mt. Clemens	1	...	...	...	...	...	Coudersport	...	3	...	1	...	...
Minnesota:							E. Stroudsburg	...	3	...	...	...	...
Detroit	...	2	...	1	...	...	Emaus	1	...	1	1	1	...
E. Grand Forks	1	...	...	...	...	1	Frankville	...	...	...	...	...	...
Hastings	...	...	...	...	1	...	Franklin	...	...	...	...	...	...
Norway	2	3	...	1	1	...	Freedom	...	...	...	...	...	...
Worthington	...	3	...	1	1	...	Gettysburg	...	...	...	...	...	...
Mississippi:							Jersey Shore	...	...	...	...	...	...
Lexington	...	...	3	...	...	...	Latrobe	...	...	...	...	...	...
Missouri:							Leighton	...	...	...	...	...	...
Fulton	...	1	...	...	...	...	Lewistown	...	5	...	1	1	...
Jeffersonville	2	...	...	...	...	...	Munhall	...	...	2	...	...	...
Washington	6	...	1	1	...	...	Mt. Pleasant	...	...	...	1	...	...
Montana:							Oil City	...	...	...	...	...	...
Kalispell	...	...	...	1	...	...	Pottsville	...	...	2	...	...	...
Nebraska:							Quakertown	...	...	...	1	...	...
Central City	...	2	...	1	1	...	Ridgeway	...	...	...	...	...	...
Columbus	...	2(1)	...	...	...	...	Scottsdale	...	...	...	1	...	...
Fall City	...	2	...	...	...	...	Sharpsburg	...	...	...	...	...	...
Grand Island	3	...	...	1	...	...	Susquehanna	...	...	...	...	1	...
Holdrege	4(1)	...	...	...	...	...	Tyrone	...	2	...	...	...	...
Nebraska City	2	...	...	...	...	...	Tower	...	...	...	...	...	...
Norfolk	...	2	...	...	...	...	Turtle Creek	...	...	...	1 ²	...	2 ¹
New Hampshire:							West Chester	3 ²	...	...	...	...	...
Concord	...	...	...	...	...	1(1)	Rhode Island:						
Littleton	1	...	...	...	...	...	E. Providence	6	...	...	2	...	...
New Jersey:							South Carolina:						
Haddonfield	1	...	...	...	...	...	Aiken	3	...	...	1	...	...
Phillipsburg	5	...	...	...	1	...	Cheraw	1	...	...	...	...	...
Pitman	5	...	...	2	1	...	Spartanburg	1	...	...	...	...	...
Rahway	(2)	...	...	...	...	...	South Dakota:						
Salem	2	...	...	1	...	...	Madison	...	2	...	1	2	...
Wood Ridge	2	...	...	1	...	...	Milbank	...	3	...	1	1	...
Woodstown	...	...	3	1	...	...	Rapid City	...	5	...	1	(1)	...
New York:							Tennessee:						
Ballston Spa	4	...	1	1	...	...	Greenville	4	1	...	1	...	...
Brockport	2	...	...	1	...	...	Milan	...	3	...	...	...	...
Canton	2	...	...	...	...	...	Pulaski	3	...	...	1	...	...
Cold Spring	1	...	...	1	...	...	Tullahoma	4	...	...	...	...	...
Cornwall-on-Hudson	...	...	...	...	...	1	Texas:						
Depew	2(1)	...	...	...	1	...	New Braunfels	...	3	...	...	...	...
Ellenville	3	...	...	1	...	...	Seguin	3	...	...	...	...	...
Fort Edward	...	2	...	...	...	...	Sulphur Springs	1	...	...	...	...	...
Gloversville	1	...	...	...	...	...	Sweetwater	...	1	...	...	...	...
Hornell	3	...	...	...	...	...	Utah:						
Little Falls	...	(1)	...	...	...	...	American Fork	2 ¹	...	...	...	...	...
Lowville	7	...	...	...	...	...	Bingham Canyon	...	7	...	...	...	...
Lyons	...	...	5	...	2	...	Eureka	...	3	...	1	1	...
Mamaroneck	3	...	...	...	...	...	Nephi	...	1	...	...	...	...
Medina	...	...	...	1	...	...	Springville	...	2	...	...	...	...
Mt. Morris	...	2	...	1	...	...	Virginia:						
Norwich	3	...	...	...	...	...	Bedford	2	...	...	...	...	...
Patchogue	(1)	...	1	(1)	...	...	Covington	3	...	...	...	...	...
Plattsburgh	4	...	...	...	...	...	Marion	...	4	...	...	...	...
Port Jervis	...	3	...	...	...	...	Staunton	...	...	...	...	...	...
Silver Creek	...	2	...	...	...	...	Washington:						
Southampton	...	1	...	...	...	...	Aberdeen	4	...	...	...	...	...
Waterloo	...	6	...	...	...	1	Anacortes	2	...	...	...	...	...
Westfield	2	...	...	...	...	...	Chehalis	...	1	...	...	...	...
Yonkers	4	...	...	...	1	...	Ellensburg	...	3	...	...	...	...
North Carolina:							Gold Bar	...	...	...	...	...	...
Kingston	1	...	...	...	...	...	Mt. Vernon	3	...	...	1	...	...
Rocky Mount	2	...	...	1	...	...	Port Angeles	...	...	...	...	...	...
Tarboro	2	...	...	1	1	...	Port Townsend	5	...	...	...	...	...
North Dakota:							Snohomish	3	...	...	...	...	...
Dickinson	2	...	...	...	...	...	Tacoma	11	...	...	...	1	...
Williston	2	...	...	...	...	...	Tolt	...	1	...	...	1	...
Ohio:							Wenatchee	...	...	...	...	...	...
Cleveland Hts.	4	...	...	...	...	...	West Virginia:						
Huron	...	...	...	...	...	1	Bluefield	1	...	...	...	...	...
Jefferson	...	...	...	1	1	...	Fairmont	...	...	...	...	...	...
Lisbon	3	...	...	...	...	...	Martinsburg	...	...	...	...	...	...
Lockland	2	...	...	1	...	...	Morgantown	...	...	...	...	...	...
Millersburg	...	2	...	1	1	...	Princeton	...	...	...	2	...	...
Mingo Junction	3	...	...	...	...	...	Wellsburg	...	...	...	...	1	...
Napoleon	1	...	...	...	...	...	Wheeling	1	...	...	...	...	...
New Philadelphia	1	...	...	1	2	...	Wisconsin:						
Orrville	...	...	...	1	1	1	Baraboo	1	...	...	1	...	...
Portsmouth	2	...	...	...	...	...	Burlington	...	3	...	...	...	...
Salem	3	...	...	1	...	...	Columbus	...	...	...	1	...	...
St. Bernard	3	...	...	...	...	...	Jefferson	...	...	...	...	...	...
Tiffin	1	...	...	1	...	...	Menomonie	...	...	...	...	...	...
Weston	1	...	...	1	...	1	Oconomowoc	...	...	...	...	...	...
Oklahoma:							Stanley	...	...	...	1	...	...
Claremore	1	...	...	...	...	...	Stoughton	...	...	...	1	...	...
Mangum	...	1	...	...	...	...	Superior	...	...	...	1	...	...
Miami	...	1	...	...	...	...	Waupaca	...	...	...	...	...	...
Oklahoma City	...	1	1	1	...	1	Waupun	1	...	...	...	...	...
Pawhuska	...	2	...	...	...	...	West Bend	2	...	...	...	...	...
Ponca City	2	...	...	...	...	...	Wyoming:						
Wagoner	...	2	...	...	...	...	Evanston	...	3	...	1	...	...
Oregon:							Canada:						
Astoria	6	...	...	...	...	...	Westmount, Que...	1	...	...	...	...	...
Hood River	...	3	...	...	...	...			
Marshfield	...	5	...	...	1	...							

¹—Hand drawn but may be trailed behind motor apparatus;
²—50-gallon extinguishers; ³—also drawn by horses; ⁴—kind not specified.

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CHANGE OF ADDRESS

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Contributions suitable for this paper either in the form of special articles or of letters discussing municipal matters, are invited and paid for. Subscribers desiring information concerning municipal matters are requested to call upon MUNICIPAL JOURNAL, which has unusual facilities for furnishing the same, and will do so gladly and without cost.

Pavements on Clay Soil.

Cracks in pavements, especially longitudinal ones, are a source of considerable annoyance to highway officials, not only because of their effect upon the pavement, but because it is generally so difficult to determine the cause with any certainty, and so prevent future cracking. Heaving of the ground by frost is the cause quite commonly assigned during the past year or two.

In Kansas, as described in this issue, concrete pavements and bases are said to be cracked by the drying out and consequent shrinking of the heavy clay upon which they rest. Exactly similar conditions were described in our February 3rd issue, as existing in San Antonio, Texas, the cracks in the concrete base there reaching a width of 2 inches. It is also interesting to note that in both cases the preventive measures applied are the same—a sand bed between clay and concrete to break the bond between the two, and steel reinforcement in the concrete.

The trouble appears to be more or less common over a fairly wide area, and deserves careful investigation. Several questions suggest themselves as pertinent. If the pavement is water-tight (and sheet asphalt on concrete may be so considered), how does the clay obtain the moisture for swelling? Or does this cracking occur only during the first hot season after laying, the moisture having been absorbed before the pavement was laid? If this is the case, would the trouble be prevented by laying new base only at the end of a hot season when the clay had reached its maximum contraction? Or by using the concrete base itself as the wearing surface for one season, and filling the cracks which develop with concrete before more rain falls; then applying a water-tight wearing surface?

It is not believable that the clay can exert sufficient pull upon the concrete base to actually compress it. Therefore the concrete itself must actually contract sufficient to produce the cracks, the openings in the clay merely helping to determine where the cracks will occur; or else the entire pavement, and the clay to which it is attached, must move bodily toward the two sides of the street, splitting apart somewhere between the curbs. It should not be difficult to determine whether the latter occurs, but it seems hardly possible if wire mesh reinforcement suffices to prevent this cracking.

If the bond between clay and concrete is broken by a sand cushion, and the clay continues to swell and shrink,

will not the sand run down into the crack each time it opens and cause a depression over it into which the pavement will settle?

Could the cracking be prevented by rolling a few inches of gravel into the clay before laying the concrete base, on the same principle that mixing sand with cement reduces checking?

These are a few of the questions that suggest themselves to us as of interest and importance in studying the problem. Others will undoubtedly occur to those who are more familiar with the phenomenon. The answering of them may not only help those road officials in districts where this cracking of the clay is known to occur, but may offer an explanation of the cracking of pavements in other parts of the country also.

An Unutilized Source of Energy.

In any hilly city automobiles and heavy wagons must apply brakes in going down the hills, and this is hard on both tire and pavement. The rutting which destroys hill-side pavements, especially dirt or macadam roads, is frequently due primarily to the practice of tying or otherwise doing all the braking on one wheel. The least wear would occur when all four wheels were subjected to an equal amount of brake friction, and none slid over the road surface.

Here is an enormous amount of energy wasted, and not only that but doing damage (as wasted energy so often does). Theoretically the energy so wasted by a vehicle in descending a hill is equal to the amount necessary to raise its weight through the distance dropped, less the axle and rolling friction in both descending and climbing the hill, which is an apparently unrecoverable loss. If this brake energy could be stored and used, hauling in a hilly city would require little more total energy than in a level one.

Various schemes suggest themselves but seem impracticable because of cost; such as causing the descending vehicle to raise a weight by means of a rope to which the vehicle attaches itself, which is afterward used to assist another vehicle up the hill. (This has been done in the case of cars running on rails.) More promising is the plan of using storage batteries in the vehicle, current generated by the braking apparatus being used to recharge them. Something similar to this is now being done in connection with the electric lights and self-starters on automobiles. It is now proposed, we understand, to operate motor trucks and possibly other automobiles by combined gasoline engine and storage battery, the latter carrying the "peak load" in hill climbing and being recharged in descending grades. If only half of the energy lost in holding back a descending vehicle can be recovered and used, and the storage battery weight and cost are not excessive, there would seem to be a great field here for conservation of energy, and cutting down of operating expenses.

Testing Well Capacity.

One of the most serious disadvantages to securing a water supply from under ground is the limited quantity available, and the danger that the capacity will be surpassed before the danger is realized and provided against. It is interesting to note that in contracting for a well supply, a Minnesota town, as described elsewhere in this issue, required that the maximum quantity necessary should be delivered without lowering the water level by more than a certain safe amount. Too often the amount pumped during a short test is the only thing considered, whereas the amount by which the ground storage has been depleted is equally important.

The WEEK'S NEWS

Road Exhibits at Iowa and California State Fairs—Mosquito Extermination in Toledo and Pawtucket—Typhoid in Altoona, Cleveland and Indianapolis—The Providence Water Supply—San Francisco's Utilities to Be Valued—Developments in Kansas Natural Gas Case—The New Jersey Rate Case—New Motor Vehicles—Mayor of Los Angeles Forced to Resign—Big Improvements for Washington—Toledo Faces Bankruptcy—Garbage and Law in Orange, Philadelphia and New York—New York's New Car Strike—Quebec Bridge Collapses Again.

ROADS AND PAVEMENTS

Road Exhibits at State Fairs.

Des Moines, Ia.—The exhibit of the state highway commission at the Iowa state fair has attracted many visitors at the fair. The commission has a permanent exhibit of types of roads and pavements for cities and rural districts and of bridge construction. This was put in last year but is apparently of more interest now than ever. The exhibit shows an entrance bridge, roadway culvert, and for city paving the following types: A one-course concrete, vitrified brick, creosoted wood block, two-course concrete, sheet asphalt and asphaltic concrete. In the country roads section the following types are shown: Earth roads, gravel roads, asphaltic macadam, vertical fiber brick and reinforced concrete. The highway commission has enlarged photographs showing road and bridge construction work in various parts of the state and how faulty road construction or bad places in roads have been overcome by proper drainage. There are also models of the types of bridge construction and retaining wall work on which patents are claimed and over which there is now litigation in this state. The models were gotten up by the state for use in a trial in the federal court.

Sacramento, Cal.—Visitors to the state fair have been much interested in a practical demonstration of road building under the direction of the California Highway Commission in co-operation with the Sacramento Good Roads Association. The actual detailed work of building a modern concrete highway is shown. The demonstration road serves to impress on visitors the importance of voting for the \$15,000,000 bond issue for completion of the state highway system.

Clear State Highways of Advertising.

Albany, N. Y.—Work of taking down advertising signs along the state roads has been started under the direction of state commissioner Edwin Duffey. Orders have gone out from the state highway department that henceforth no advertising signs will be permitted along the state roads. Only those signs found within the state highway limits or between fences flanking the highways will be removed. In addition to spoiling the beauty of the highways motorists claim that the signs have become so numerous that they cause confusion and are detrimental to travel. Automobile clubs and associations have signs of uniform design and color warning motorists of dangerous curves and steep hills and giving directions regarding roads, mileage and highway conditions. Signs which announce a curve are always set 500 feet from the curve, are of a certain color and contain certain information which may be checked up in the tour books. Advertising signs are stuck up at all sorts of places and follow no uniform plan.

City Gets Free Street Work.

Stockton, Cal.—The litigation involving the \$84,000 street paving contract of Eaton & Smith was ended when Judge D. M. Young sustained the demurrer of city attorney D. V. Marceau, representing the city in an action brought against it by Eaton & Smith. The firm had sued for between \$18,000 and \$19,000 alleged to be due for work they had done. The contractors, an Oakland firm, were awarded a contract for the repaving of many streets, which provided

that payments were to be made by the city in three annual installments. After work had been started and the contractors had furnished labor and material valued at more than \$18,000, a taxpayer secured an injunction restraining the contractors from proceeding further and preventing payment by the city on the grounds that the contract was illegal. Judge J. A. Plummer held that the contract was illegal because of the three-year payment plan, the charter providing that the city council could not incur debt for more than one year without having the people vote bonds. The ruling of Judge Young means therefore that the city will receive for nothing about \$18,000 worth of street work.

Auto License Fees Aid Roads.

Sacramento, Cal.—There are 189,610 automobiles, 25,935 motorcycles, 10,191 chauffeurs, 1,254 auto dealers and 193 motorcycle dealers in California, and, according to the semi-annual report of Superintendent H. A. French of the state motor vehicle department, a total of \$1,993,501.71 was received from the licenses and fees during the first six months of the present year. All of the counties of the state are the beneficiaries of this state vehicle license and fee requirement, in that one-half the proceeds go to each to be used in the maintenance of roads and highway systems. The counties of California for the first six months in this year, ending June 30, will receive from the state a total of \$893,573.84. This money, under the law, goes into the road repair fund of each county, and is prorated to the counties according to the number of auto and other licenses collected from each county. It is shown in the report that the net receipts are \$1,938,042.21. Los Angeles leads the state in autos, the payment of fees and, of course, the money received for use on the country roads. There are 61,137 autos in the Southern California city, 8,012 motorcycles, and the collections amount to \$655,381.75. Out of this the county gets \$291,042.81 for road repairs. San Francisco is next on the list with 20,457 autos, 1,826 motorcycles, the gross receipts are \$235,394.93 and the county gets \$104,482.39 for use on the roads—in this case streets.

SEWERAGE AND SANITATION

Mosquito Elimination Survey.

Toledo, O.—It will cost about \$293,000 and require an act of the legislature to create a commission to rid Toledo of the mosquito pest, according to the report of the mosquito elimination committee of the Commerce club which embodies a comprehensive plan for the undertaking. It contemplates a vote for a bond issue for the widening and deepening of mosquito infested streams and the reclamation of thousands of acres of marsh land. It is said it would require about two and a half years to complete the proposed improvements. The activities of the Commerce club in its fight against mosquitoes were begun some months ago with the visit of Dr. Carrol Fox, federal expert, who made a survey of the situation. A committee was appointed to take up the work. Dr. T. L. Ramsey, who has had experience in mosquito elimination in Panama, is chairman. The other committee members include William H. Gould, who has had experience as a sanitary engineer, John Schlatter, attorney, and Frank B. Respass, secretary of the division of public parks. For the purposes of the survey the city was divided into five districts. In general

the recommendations of the engineer, adopted by the committee, are to eliminate the breeding places of mosquitoes by dredging, draining and filling in the low places. The added advantages pointed out by Mr. Gould are the prevention of flood damage, the improvement of stream channels, confining the streams within their banks, and the assistance in protecting the streams against pollution. As the best means to accomplish this in the first district, Mr. Gould has recommended the construction of lateral ditches, at a cost of about \$5 an acre, or \$12,000 in all. The greatest cost, he finds, would be entailed in correcting conditions in the second and third districts, each of which would require an expenditure estimated at \$125,000. From its source in Royalton township, Fulton county, Ten Mile creek drains a watershed of 82,000 acres. The pollution of this stream for 10 miles above its mouth, its crooked course, and the nature of its bed, are difficult conditions to be dealt with. The marshy sections most favorable to mosquito breeding are found to be at the outlets of connecting streams, particularly Mudjau and Sibley creeks and the bayou just east of Michigan avenue. To correct this condition, Mr. Gould has recommended dredging the main stream, particularly at the outlets of smaller creeks, and using the earth from these places to fill in the depressions. From these districts, the prevailing winds, indicated by the arrow in the map, carry mosquitoes toward the western residence sections, the engineer finds. The engineer states that the value of the reclaimed land alone would pay for the work done and that Ten Mile creek could be made navigable for pleasure boats. In the more thickly populated residential sections the problem is found to be one of public education in disposing of refuse vegetable matter, screening houses, whitewashing cellars, and a certain amount of disinfecting. Regarding the legal aspects of the situation, a report by attorney John Schlatter indicates that little hope should be attached to the possibility of assessing the cost of reclaiming marsh land upon the adjacent and benefited property. The conservancy act, passed by the Ohio legislature

in 1914, is declared perhaps the broadest of the state laws bearing on this manner of improving lands. It is doubtful, however, whether the courts would construe the conservancy act as applicable in the Toledo situation. Therefore, he suggests the enactment of legislation similar to that adopted by the state of New Jersey in 1912, specifically providing for a commission to be empowered to handle work of this character.

Progress on Dallas Sewage Plant.

Dallas, Tex.—Contractors on the city's new sewage disposal works have completed one of the biggest units of the system, the thirty-six-inch concrete force main from the pumping plant to the disposal tanks three miles south of the city, according to a report furnished city engineer Hal Moseley. The approximate cost of this work was \$100,000. The main will soon be tested. Many months have been required for its construction, operations having been delayed once or twice on account of floods. The entire system is expected to be ready for operation in November.

Typhoid Epidemic in Altoona.

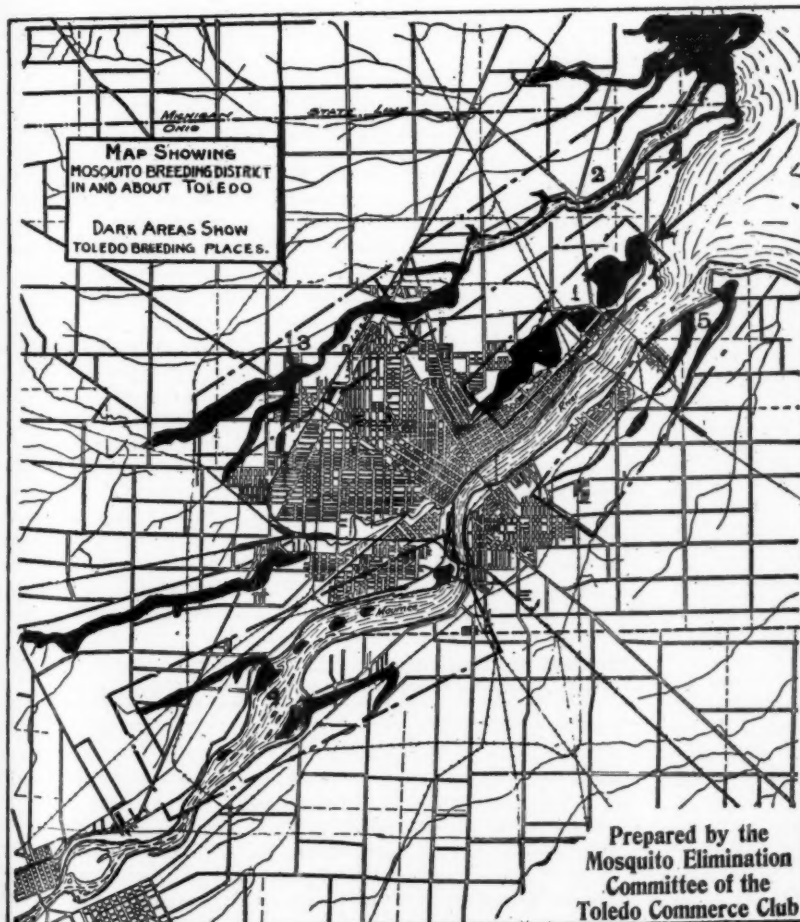
Altoona, Pa.—The number of cases of typhoid fever is rapidly increasing and Altoona Hospital has over 80 cases. The health authorities are unable to trace the source of contagion. The State health department has issued notice that disinfecting apparatus at the city reservoir outlets must be installed at once and also requested the local officer to issue orders requiring all water to be boiled for domestic purposes. State Health Commissioner Dixon sent out orders to the railroads that "use of water from city mains on trains or railroad property is prohibited until further notice, unless it is distilled or boiled for at least 20 minutes, subjected to steam pressure of 15 pounds maintained for 15 minutes. Use of ice manufactured from undistilled city water is likewise prohibited on trains and railroad property."

Typhoid Increases While Plant Failure is Studied.

Cleveland, O.—Reinforcement and rebuilding of portions of Cleveland's filtration plant that collapsed that must be completed before the plant can be put into service may add \$200,000 to the cost of the work. Deputy water commissioner C. P. Jaeger made this estimate on receiving a report from Frederick C. Noble, a New York expert, who has been studying the foundation and general construction of the new plant. Mr. Noble's report is largely confined to the settling basins, filter house and mixing chambers. Reinforcement recommended by him will cost the city about \$45,000. The deputy commissioner of water estimated that repairs and rebuilding of part of the clear water basin and other portions of the plant will cost an additional \$15,000. City officials believe that it would be practically impossible to open the plant this year. The city health department is concerned over this development because there has been a marked increase in typhoid cases in the last few weeks, twenty cases having been reported in the first two weeks of August. Noble in his report states that the concrete work in the portions of the structure he examined are generally good, but that the soil beneath the plant is of a generally yielding nature. This has resulted in settlement and cracks. The report may cause the city to abandon the lake front location near the Kirtland station as the site for the new East Side filtration plant. The plant may be located in Cleveland Heights adjoining the Baldwin reservoir.

Mosquito Elimination for Pawtucket.

Pawtucket, R. I.—The board of aldermen has voted an appropriation of \$3,000 for the purpose of continuing on the Pawtucket side of the line the work already begun by Providence for the extermination of the mos-



THE MOSQUITO SITUATION IN TOLEDO.

quitoes breeding along the Moshassuck river. This breeding area, which, following the work almost completed by Providence, is now confined to Pawtucket, has been designated by Dr. Jos. A. Le Prince, the federal sanitation expert sent here to investigate the mosquito pest. George A. Carpenter, engineer, stated that the work of improving the river will be started just as soon as Providence completes its work to the Pawtucket city line. The project is undertaken in accordance with the understanding at the conference held in Providence between mayor Easterbrooks, commissioner of public works Gill and city engineer Carpenter, representing Pawtucket, and mayor Gainer, commissioner of public works Slade and city engineer Bronsdon, representing Providence. Negotiations are now pending with riparian owners. Dr. Le Prince finds from his survey that by far the greater number of young mosquitoes, which have been the chief source of annoyance this summer, have been carried down from above the city line.

Vaults Cause of Typhoid Epidemic.

Indianapolis, Ind.—Typhoid is getting a strong hold in the city, particularly in one section, the total number of cases reported during August being over 400—more than twice as many as in any other month in the city's history. Many are being vaccinated. The existence of insanitary and open vaults, of which it is estimated there are 30,000 in Indianapolis, is given by the board of health as the principal cause for the spread of typhoid fever. Dr. H. G. Morgan, secretary of the board, stated that the serious situation resulting from the spread of the disease would not exist if the board had authority to compel all householders to make sanitary connections with the city's sewerage system. A survey of all cases reported reveals that more than 60 per cent of the patients live in homes where there are no sanitary toilets. The percentage is increasing daily, according to Dr. Morgan, who declared many other cases have resulted indirectly from the open vaults. The men engaged in vault cleaning have been from three to four weeks behind their contracts during the summer months. A scarcity of labor is one reason given for this condition.

Expect End of Poliomyelitis Epidemic Soon.

New York, N. Y.—The number of new cases of infantile paralysis continues to decrease and Deputy Health Commissioner John S. Billings is confident that the epidemic will be over by October 1. Public schools are to be opened September 25, meanwhile the teachers have reported and are attending "institutes," where lectures on educational subjects are delivered. The total number of deaths up to Sept. 13 is 2,142, and the number of cases, 8,589. It has been observed that the death rate is rising with the decrease in the number of cases. The serum treatment continues to be administered with success. Responses to Health Commissioner Emerson's appeal for a fund for braces for the discharged patients has been generous, over \$30,000 having been contributed. The situation in surrounding communities has not been as good as in New York, but promise of an early end to the epidemic is indicated. In Philadelphia, Dr. Earl C. Peck, a young physician who had been working strenuously at the Philadelphia Hospital for Contagious Diseases on infantile paralysis cases, himself succumbed to the disease.

WATER SUPPLY

Plans for Providence Water Supply.

Providence, R. I.—The plan of Chief Engineer Frank E. Winsor for immediate filtration of the new Scituate water supply as against a general stripping of the bed of the reservoir has been adopted by the water supply commissioners after consideration of the plan together with those of the consulting engineers, Allen Hazen, of New York, Frederick P. Stearns of Boston, and Samuel M. Gray, of this city. It was announced that because of the condition of the labor market there may be some delay in the letting of the contracts for the work. The four recommendations of chief engineer Winsor adopted by the board are as follows: Immediate filtration of the new water supply; covered distribution reservoirs to be available when the new supply

is introduced; increasing the pressure in the low service by 10 to 20 pounds, and the omission of general reservoir stripping at the Scituate plant except in so far as stripped material may be essential in building the dam and other structures. The board particularly considered the cost of stripping which the engineer estimated at not less than \$700,000 under the most favorable circumstances. Topographic surveys, sub-surface investigations and studies at the Scituate reservoir have been and are actively in progress. The board has already approved the flow line and the location of the main dam. Both the elevation of the flow line and the location of the dam have received the indorsement of consulting engineers Gray and Stearns. The construction of the work will be divided into contracts, the first of which, the engineer suggests, should be the main dam, this being the structure which will probably require the longest time to build and upon which the entire project is dependent. The design of the dam involves a decision upon nearly all of the fundamental questions concerned in the entire project and the attention of the designing staff has been devoted in considerable part to these studies during the past few months.

Water District Wins Bond Litigation.

San Rafael, Cal.—The Marin municipal water district won the first legal skirmish in the fight to test the validity of the water district act of 1911 under which the local district was created. Superior judge A. B. McKenzie of Contra Costa county, sitting for judge E. T. Zook, in the case of Leon F. Douglas against the district, decided that the \$3,000,000 bonds voted to acquire the existing water companies are valid. Douglas bought \$25,000 worth of the bonds and later refused to pay for them, claiming that the act under which the district was created was unconstitutional. The case will be appealed.

City Refuses to Buy Waterworks.

Chattanooga, Tenn.—The board of commissioners has formally declined to exercise its option for the purchase of the City Water Company, on the grounds that the price set by a board of appraisers recently, \$2,600,000, is out of the question. The price is a million dollars more than the commissioners think the plant is worth. There will be no further opportunity for the city to purchase the plant through arbitration before 1921.

To Value San Francisco Utilities.

San Francisco, Cal.—A valuation is to be placed on the properties of the Spring Valley Water Company by the Railroad Commission, with the ultimate view of their purchase by the city. The board of supervisors has adopted a resolution directing that proceedings be commenced before the commission to determine the value of the various holdings of the water company. This action was taken on recommendation of the public utilities committee. Supervisor Gallagher has suggested that the same action be taken with reference to the properties of the United Railroads. He said the time might not be far away when it would become expedient for the city to own all of the street railways operating on its streets and it would be well to have some competent body determine the value of the property in the near future. It is believed that if it is the purpose to submit to the people a bond issue for the purchase of the Spring Valley Water Company's properties, it would be well to couple with it a bond issue for the purchase of the street railways.

STREET LIGHTING AND POWER

The Kansas Gas Rate Case.

Kansas City, Mo.—City, consumers and local company are cooperating in the fight against the Kansas Natural Gas Company's increased rates. The Kansas City Gas Company, in a suit filed against the Kansas Natural Gas Company in the circuit court asks that the producing company be forced to live up to its contracts with the Kansas City company. It should furnish the distributing company ample gas to enable it to fulfill its franchise terms to the city, and should maintain the old rate of charge, according

to the petition. This was 62½ per cent of the gross receipts of the Kansas City Company. The Kansas Natural now wants to charge eighteen cents a thousand cubic feet at the city's gates. The petition states that the defendant and John M. Landon receiver, have "threatened to stop the supply of gas to the plaintiff and thus cut off the people of Kansas City from the use of natural gas, unless the plaintiff yields to their illegal demand for an increased price therefor contained in a notice of August 12, 1916."

J. A. Harzfeld, city counselor, has filed a motion in the circuit court asking permission to make fifteen gas consuming parties to the city's suit now pending against the gas company so that they can prove their damages against the gas company. This intervening petition will ask for the return of money paid by them to the gas company under protest because of the low gas pressure last winter. The petition sets forth: That the gas pressure was not sufficient; that the gas would not burn; that the gas company is not entitled to collect for such service. The city's position is that it will represent any citizen who desires to be represented by it. Kansas City, however, according to the city counselor, cannot legally give a bond for any citizen and become liable for his gas bills, nor can the city bring separate suits for damages on behalf of any individual. The two houses of council have decided to investigate the gas situation through committees.

Topeka, Kans.—The new 35-cent rate for gas has been announced by L. G. Treleaven, receiver for the Consumers Light, Heat and Power Company, in a circular issued to gas consumers. According to the statement, 50 cents net per thousand will be charged for the first 3,000 feet, with a minimum charge of 50 cents; the rate for all over 3,000 will be 35 cents per thousand. The company promises a more adequate and continuous supply; better service than last winter, but not so good as may be expected the following year, and not sufficient for heating during the cold periods of the coming winter. The company says that the business for 1915 was conducted at a loss of \$55,000. The statement is made that \$26,000 was paid to Shawnee county for taxes, or more than \$2 for each consumer. The hardship of the new rate seems to be in the price of 50 cents per thousand for the first 3,000 feet, making the small consumer, who has heretofore used 2,000 feet at a cost of 56 cents, pay \$1. The company says that this is the expense per thousand: Local distribution 14¼ cents, taxes 6½ cents, total 20¾ cents; bonds, interest and depreciation 17 cents, total 38 cents. For this the company says it received 9½ cents. The new rates are due to the increases made by the Kansas Natural Gas Company.

Lawrence, Kans.—Notices have been sent out by the Citizens Light, Heat and Power Company, passing on to gas consumers the new prices made by the Kansas Natural: Thirty-eight cents per thousand cubic feet, subject to a discount of three cents per thousand cubic feet for payment on or before the tenth of the month following that in which the gas is consumed. The minimum bill is fifty cents per month. Manager C. J. Dodds of the local company said that the distributing company expects to be able to furnish more gas this year than in either of the two preceding years and that next year the amount will be as large as ever. This year practically all of the improvements made will have to be concerned with getting a greater supply, and next year more attention can be given to facilities for distribution.

New Jersey Utilities Rate Case.

Trenton, N. J.—Every community served by the Public Service Electric Company has been notified by the State Board of Public Utility Commissioners that hearings in the electric rate cases started last spring by Newark and Jersey City are about to be resumed. The first of these hearings has been set for September 25 at the State House. A number of other places followed the example of Newark and Jersey City. Among them are Hoboken, Harrison, Lodi, Verona and Linden Township. The board in its notices says: "The petitions raise the question, whether in the determination of a just and reasonable rate to be charged consumers of electricity by the Public Service Electric

Company, all the property used by the company should be considered as a unit and a uniform rate fixed, or whether the property value should be segregated, proportional central station costs and other general expenses allocated to each municipality, and a separate rate fixed for it. The latter method of fixing rates appears to be considered by the municipalities petitioning for separate rates the more reasonable of the two."

Taxing for Street Lighting.

Spokane, Wash.—The State Supreme Court has ruled that the Ridpath estate must pay the city for the installation of the First avenue street lighting system abutting on the Ridpath property. The decision was given in the appealed case of the Ridpath estate against the city, the estate contending that the furnishing of electric current for street lighting is not a local improvement. The upholding of the city's power to tax the abutting property for the street lighting system affects all the lighting in the city, the First avenue system representing about \$60,000.

FIRE AND POLICE

To Vote on Two Platoons.

San Francisco, Cal.—A charter amendment providing for a two-platoon system in the fire department will be submitted to the voters at the coming general election. An initiative petition carrying the signatures of 34,500 voters of San Francisco has been filed with the Board of Supervisors asking that the charter be so amended that the system can be installed. It is provided that the proposed amendment will not go into effect until 1919, when it is expected the horse-drawn apparatus will be supplanted by motor vehicles and that there will be necessary very little addition to the number of men on the pay rolls of the department to provide for the double shift.

To Install Police Alarm System.

Charleston, W. Va.—A police alarm and telephone system is to be installed in Charleston immediately, according to an announcement by city manager Wise. The system will be provided by the telephone company and the police department will make use of it on a rental basis. There will be 22 telephone stations at various places on both sides of the Elk river, and the instruments will be equipped with gongs that can be heard by patrolmen for a distance of several city blocks. All calls for police will be sent into headquarters at Virginia and Court streets, as they are under present arrangements, and the sergeant will then call the patrolman covering the beat nearest the section from which the call was received. The telephone system will cover an area of nineteen and one-half square miles.

Fire Drills in New Training Tower.

Watertown, N. Y.—A series of drills in which all of the men of the fire department will be given instruction in aerial work and rescuing persons from burning buildings will be started at once in the training tower at No. 4 engine house. The completion of the tower, which has been under construction during the year, has been announced by fire chief H. C. Bundy. The tower is 76 feet high, of concrete and steel construction. Upon the front five stories of a building are represented by a series of windows, two windows on each floor. On one side there is but one window on each floor, and none on the other sides. An iron stairway within the building leads from the floor to the top, which is of concrete with a concrete cornice. A well which extends from the ground to the roof provides a space in which 2,000 feet of hose can be hung to dry. It is expected that regular drills will be held twice a week, a number of the men of the different companies being assigned to the work on different days. Spectacular features and "stunts" which used to be a large part of such work will be eliminated from the drills, according to chief Bundy. The men will be drilled particularly in the use of the pom-pier scaling ladders. They also will receive instruction in saving people from burning buildings and carrying them down ladders and ropes to the ground. Jumping into nets and similar drills will not be a part of the work.

MOTOR VEHICLES

City Buys New Combination.

Chico, Cal.—The city trustees have purchased a \$10,000 motor-driven combination pumping engine and hose wagon for the fire department. Its capacity is 1,000 gallons. The purchase was hastened because of the large loss resulting from recent fires. It will arrive within four months. The new machine will be capable of carrying 2,000 feet of 2-inch hose and 250 feet of 1½-inch hose.

New Combination Purchased.

Canby, Minn.—The city has placed an order with the Luverne Automobile Company of Luverne, Minn., for a Luverne combination chemical and hose truck. The truck will have a six-cylinder 60 h. p. motor, with electric starter, double ignition system, and complete electric lighting equipment. The wheel base is 150 inches, and the tire equipment Goodyear cushion, single in front and dual on rear wheels. The chemical equipment will be a single 40-gallon Holloway type chemical tank and two hand extinguishers.

Home-Made Truck Completed.

Passaic, N. J.—The new combination hook and ladder, chemical and hose truck, built almost entirely at the shops of the fire department, has had a trial spin with captain P. Spencer Pearl, designer, in charge. It was inspected by fire chief Reginald H. Bowker. The new truck is 30 feet long and weighs seven and one-half tons. Every part of it, excepting the chassis, which was constructed by the Hershey-Spillman Company, was made at the department shops under the direction of the fire chief and captain Pearl. Besides holding more than 1,500 feet of regulation fire hose, the truck carries 165 feet of ladders and the usual 35-gallon tank of chemical extinguisher with 200 feet of one-inch chemical hose. Chief Bowker declares that in building the truck at the shops here he has saved the city between \$1,200 and \$1,500. The machine took the trial runs and the rugged hills at a good rate.

GOVERNMENT AND FINANCE

Los Angeles Mayor Resigns.

Los Angeles, Cal.—Mayor Charles E. Sebastian has resigned from office and left the city without a mayor until his successor was selected by the city council. The charter makes no provision for any regular succession in such cases. Sebastian gave as his reason ill health and worry, but it is known that his action was brought on by continuous criticism and ridicule by a local newspaper. After the resignation had been sent in, Sebastian's wife asked council to refuse to accept it, as the mayor was sick when he signed the paper and would like to withdraw it. Council, however, accepted the resignation. The signature to the paper was obtained by members of the Merchants' and Manufacturers' Association. Sebastian has filed libel suits against two, based on the newspaper attacks. The resigned mayor was previously chief of police and had been involved in a sensational trial. The new mayor is Frederic T. Woodman, head of the harbor commission.

The Capital's Appropriation.

Washington, D. C.—President Wilson, under emergency rules, has signed the District of Columbia appropriation. With practically every department given increased appropriations, the local government will make a great number of new improvements. The total amount appropriated is approximately \$1,000,000 greater than the largest allowance of any previous year. Streets, schools and correctional institutions fare particularly well, while the police and fire departments also are liberally provided for. Not only are these departments given an adequate retirement and pension system, but the fire department is to be permitted to buy nine pieces of motor apparatus, costing \$56,000, which is the greatest advance made in any one year toward motorization of the department. Salaries of police officers are raised to the standard maintained by other

cities; a new stationhouse in the Brookland section is provided for, and amalgamation of the crossing police with the metropolitan force also authorized. Streets received the largest increases. Compared with a maximum appropriation heretofore of about \$200,000 for suburban roads, the act this year furnishes \$440,160 for improvements of this character. The 400 employes on the "white wing" force are particularly pleased. After three years' effort to obtain increased wages, the street sweepers are to have their pay raised from \$1.50 to \$1.75 per day, largely through the efforts of President Wilson, the district commissioners and William McK. Clayton of the Citizens' Associations.

Toledo's Tangled Finances.

Toledo, O.—Mayor Milroy and his cabinet are going salaryless in order to give the city a chance to continue operations with the almost exhausted funds at its disposal. The present situation was directly brought on by the failure, after two elections, of the passage of a deficiency bond issue, first for \$1,500,000, and then for \$850,000. The city has only about \$200,000 on which to operate until next March, but the money will last only until the end of October. The city has borrowed from the Federal reserve bank at Cleveland \$650,000, \$250,000 of which is due September 28 and the remainder on October 1. Should the city be unable to pay, the situation would be equivalent to bankruptcy. While mayor Milroy was absent from the city, safety director Newton laid off sixty-six policemen and seventy-eight firemen for ten days without pay, but on his return the mayor announced that the procedure was illegal. A number of inspectors, engineering assistants and office workers were discharged. The mayor's salary is \$500 a month. By passing this, and the paying of only half the salaries of councilmen and of all employees who have more than \$1,800 a year, finance director Kilmer estimates that \$5,500 a month can be temporarily saved. Meanwhile local bankers are in constant conference. Another bond issue election is being urged.

STREET CLEANING AND REFUSE DISPOSAL

City Wins Against Garbage Contractor.

Orange, N. J.—Finding nothing arbitrary or unreasonable in the action of the city commissioners of Orange in terminating the garbage contract with James D. Moriarty and awarding it to the Moloney Contracting Company, the Supreme Court has dismissed the proceedings brought by Moriarty contesting the proceedings by which the contract was abrogated. The opinion of Justice Swayze held that sufficient justification for the board's action might be found in the fact that within a period of six weeks he had twice pleaded guilty to violating the provisions of the contract. Moriarty's contract provided for the removal of ashes and garbage for a period of four years from August 20, 1914. It stipulated that if he should be found guilty of a violation of the specifications the city should be entitled to \$50 for liquidation damages. It was further agreed that if the work was not performed satisfactorily to the board, the contract might be terminated. Such action was taken by a resolution adopted May 9 last. On the following day a contract was made with the Moloney Contracting Company. Admitting that the resolution was not such as is contemplated by the commission government act, Justice Swayze pointed out that the act invoked by Moriarty is intended only to reach original contracts and not to include merely subsidiary contracts already provided for by the terms of contracts duly made. The original contract with Moriarty was not questioned, and the court found in this contract implied authority for the sub-contract with Moriarty and his surety. "It was legal," continued Justice Swayze, "to insert in the contract provision for a termination. It may be extra-statutory, but that is very different from being illegal. The suggestion that the right to terminate a contract opens the door for the evasion of competitive bidding is without force. If, in fact, the provision is perverted for the purpose of evading the requirements of competitive bidding the court can readily correct by

setting aside the fraudulent contract. There is no suggestion of fraud in this case. If the prosecutor (Moriarty) was in fact misled by the mayor, it was his own fault. His mistake, or the conduct of the mayor, could not bind the board. By the contract it was the board that was to be satisfied, not the mayor alone. Whether the prosecutor was under a legal obligation to remove house refuse or dead animals is of no importance. If an attempt was made to impose upon him greater burdens than the contract warranted, his remedy was to refuse to do the extra work and stand on his contract rights. Arguments that the contract with the Moloney Contracting Company should have been let only after competitive bidding cannot prevail. That contract was only a means of carrying out the provision of the original contract with Moriarty—a sub-contract. Nor is there any proof that the appropriation will be exceeded by carrying out the contract with the Moloney Contracting Company." The city's next step, it is stated, will be to sue the company which bonded Moriarty to recover the difference between \$45 a day, which he was paid, and \$75, which is being paid the Moloney company. Since the effort to annul Moriarty's contract the city has been receiving double service, both contractors collecting ashes and garbage.

Philadelphia Garbage Litigation.

Philadelphia, Pa.—J. Washington Logue, as referee, has filed a report in common pleas court in the suit of Frank H. Shattuck, trustee in bankruptcy of the estate of the American Product Company, against the city, which was brought to recover \$53,108.33. The product company had a contract with the city for the collection and disposal of kitchen garbage covering the year 1913. In the fall of that year director of public works Cooke, contending that specifications of the contract were being violated, rescinded the agreement and injunction proceedings followed. The referee recommended that \$7,500 be paid to the company.

Collection of Business Building Ashes.

New York, N. Y.—Court action has been instituted on behalf of an office building to determine the legality of the recent order issued by the department of street cleaning directing owners of all business and office buildings to remove their own ashes. The street cleaning department, in its announcement of the new order, stated that it was based on a court order restraining the department from collecting ashes and waste from office and business buildings. Lawyers for the complainant state that there is no such order. There is an injunction secured by Daily & Ivins, the firm which takes the material from the city dumps on scows, but that only restrains the city from placing on the scows certain material, such as boxes and boards, which the company is not under contract to remove. The Temple Bar building, whose owners complain, disposes of twenty or thirty cans of ashes daily during the summer and about fifty in the winter, according to the superintendent. Since the street cleaning department suspended collection service the building authorities have allowed all their ashes to pile up and now has all its available cellar space occupied and must use the adjoining sidewalks to store the ashes. To carry out the terms of the department's order, the building owners would have to make a contract with an outside firm for the removal of the building's ashes each day, at a cost of between \$600 and \$1,000 a year. "There is nothing to hinder the department of street cleaning from taking steam coal ashes from public office buildings," says the complaint. "The court of appeals has said that the department need not collect general litter or trade waste from department stores and business places, but said that it must take ashes from such places. We are entitled to this service as taxpayers of the city and intend to secure it." The order does not affect materially the manufacturers in lower Brooklyn, as the majority of these have been carting their ashes away themselves at a cost of from \$40 to \$150 a month. All the manufacturing and business firms affected by the order, or which have been carting away their own ashes for years, are following the course of the Temple Bar building litigation with interest and if it succeeds there will be a general effort to secure similar relief.

RAPID TRANSIT

New York's Traction Strike.

New York, N. Y.—The city is again in the grip of a car strike, the walkout starting on the Interborough subway and elevated lines spreading to all the surface car lines in the five boroughs and in Westchester. The number of men reported on strike is given with wide variations, but traffic is seriously affected. An appearance of normal service is maintained at times on the subway and elevated lines, fewer and shorter trains being run with loyal men, and a large proportion of strike breakers. Few motormen have gone out because they are affiliated with another union than the one organizing the strike. A very few street cars are running at irregular intervals and after sundown all cars remain in the barns. Passenger traffic in the city is demoralized and all kinds of vehicles are resorted to—innumerable jitney busses, of every conceivable kind of machine, are carrying crowds of people at fares ranging from ten to fifty cents. This traffic is against the law, but the police are winking at the violation. All cars are run under strong police protection, and there has been no violence. Both sides are determined to hold out and the employees are enlisting the aid of the powerful city, state and national unions to call a sympathetic strike of thousands of workers. The city officials and the state public service commission are investigating the causes and are trying to end the situation. Each side charges the other with violating the agreement of Aug. 7, but the strike is due to the attempt of the company to eliminate the Amalgamated Association of Street and Electric Railway Employees and to substitute a company-made union. The circulation of "master and servant" contracts among the men, which would have given them no chance for action for two years, was also distasteful to the men. In an accident in which a street car, run by a strike-breaker, crashed into a jitney, two were killed and twelve injured.

Jitney Ordinance Follows Kates Law.

Elizabeth, N. J.—Mayor Mravlag has signed the jitney ordinance drafted by city attorney Hague and passed by the board of works. Its authority is derived from the Kates laws, which gives cities the right to adopt regulations governing jitney traffic. A provision requires jitney owners to pay five per cent of their gross receipts into the city treasury. Licenses and bonds of \$5,000 are required. In order to collect the five per cent of gross receipts for the city, it has been provided that a recording device must be furnished for each car, and that reports must be made monthly to the city treasurer. The owners themselves are glad enough to have an automatic count on the nickels taken in by their drivers or collectors, but they are having difficulty in finding a practicable device. The demand has been so great from cities throughout the state that the makers of such machines have given assurance that they will be able to produce the kind wanted at a reasonable cost.

To Apply Balances to New Contracts.

New York, N. Y.—The Public Service Commission for the First District, working in connection with the office of the City Comptroller, has agreed upon a series of unexpended balances remaining from previous appropriations by the Board of Estimate and Apportionment for rapid transit work, which may be applied to new contracts. The total of the balances as fixed by the two offices mentioned is \$1,141,467.96, of which \$951,341.56 may be applied to contracts under Contract No. 4 (the operating contract between the city and the New York Municipal Railway Corporation), and the remainder under Contract No. 3 (the Interborough Rapid Transit Company operating contract). The agreement as to the application of these unexpended balances makes it possible for the commission to refer to the special meeting of the Board of Estimate tomorrow (Tuesday) several pending contracts, small in amounts but of tremendous importance in the rapid transit work. One of the most important of these is the contract for the installation of tracks in the Broadway subway, extending from 59th street and Seventh avenue, Manhattan, to Prince street and Flatbush avenue extension, Brooklyn.

MISCELLANEOUS

Title to Waterfront Lands.

Sacramento, Cal.—Title of the Central Pacific and Southern Pacific Railroads to Sacramento water front lands valued at millions of dollars has been affirmed by the United States circuit court of appeals as against the claims of the Ennis-Brown Company of Sacramento and fifteen others that the railroads held the lands illegally. The court decided that as the railroads had held the lands since 1864 and had improved them for terminal purposes and no effort had been made to cloud the title over such a stretch of time, there was no equity in the plaintiff's contentions. The court declared that the suit should have been for damages at law; that it was not an action in equity under the circumstances. Ennis-Brown Company and associated plaintiffs claimed the railroads' title was invalid to a portion of their holdings riparian to the Sacramento river within the corporate limits of Sacramento on the ground they had never been used as terminal facilities.

Two Cities Dedicate Bridge.

Keokuk, Ia.—Official dedication exercises have been held for the new Keokuk-Hamilton double-decked bridge, which cost \$400,000, and on which work has been going on for sixteen months. City officials and business men of both cities and from Hancock and Lee counties met at the state line in the middle of the upper deck of the bridge to listen to the speeches. Original estimates of the cost of the new bridge placed it at \$300,000, but complete it is \$400,000.

Quebec Bridge Span Collapses.

Quebec, Canada.—More than 50,000 persons, massed along both banks of the St. Lawrence River here to watch the start of the raising to its supports 150 feet high, the largest bridge span in the world, saw it sag suddenly at the huge chains that held it, quickly buckle in the middle, and with a roar collapse and sink 200 feet to the river's bottom. A multitude of small craft that held crowds of sightseers, including titled cabinet members and many noted engineers, hurried to the spot and started the work of rescuing as many as possible of the ninety-odd workmen who had been dashed into the river when the collapse came. Of these eleven are known to be dead, either from drowning or injury, and the bodies of more, it is feared, may be found later. A score of injured survivors are in hospitals. The scene of this disaster is the same spot where on Aug. 29, 1907, a bridge structure different in form but designed to be of nearly the same magnitude, collapsed with the loss of seventy lives. While officials and engineers were striving to learn the cause of the collapse the Dominion Government, which had offered a million-dollar subsidy to the builders, the St. Lawrence Bridge Company, for completion of the work, had started an investigation to place the blame for the accident. The loss in material is estimated at \$600,000. The total cost of the bridge was to be \$17,000,000. The bridge was to connect this city with the opposite bank of the St. Lawrence River, and to carry the traffic of eight railroads, cutting off 200 miles of the rail distance from Halifax to Western Canada. The entire structure, weighing more than 5,000 tons, was built on the pontoons, as it was to rest later above the river. Every possible precaution was taken for safety in construction and placing of the spans. The project originated in 1853, when, at the request of the Quebec City Council, a New York engineer submitted plans and estimates. After many years of delay the building was begun, only to have it terminate disastrously in the collapse of the unfinished structure in 1907. Canada's Federal Railway Department decided to reconstruct it, and the undertaking was placed in the hands of a commission, which included several noted American bridge builders, among them Ralph Modjeski, of Chicago, and C. C. Schneider, of New York. Plans for the bridge provided for a channel span longer than that of any existing today. Its length form shore to shore, when completed, was to have been 3,239 feet, and the space between the anchor buttresses, 1,800 feet. There were to be two railroad tracks, two street car tracks, and two roadways.

LEGAL NOTES

A Summary and Notes of Recent Decisions— Rulings of Interest to Municipalities

Estimate of Cost—Method of Making.

Wardeman v. City of Columbus et al.—In making an estimate of the cost of street pavement a city engineer is not required to estimate separately the cost of each item going to make up the completed whole.—Supreme Court of Nebraska, 158 N. W. R., 424.

Ownership of Highway—Private Use.

Birmingham, E. & B. R. Co. v Stagg.—Public highways belong to the public from side to side and from end to end, and one using a public highway for his own private use commits an indictable public offense, notwithstanding it may be so used with the permission of the municipal authorities.—Supreme Court of Alabama, 72 S. R., 164.

Change of Grade Ordinance—Validity

McGuire v. Wilson, Mayor et al.—An ordinance purporting to establish a new street grade, not showing whether the elevations given were above or below the directrix, was without meaning and void, although there were profile maps on file in the city clerk's office showing more particular data in reference to the grade.—St. Louis Court of Appeals, Missouri, 187 S. W. R., 612.

Surface Water—Culvert.

Cornet v. Meckel Realty and Investment Co.—The maintenance of a sewer pipe under a street which was in fact a culvert constructed in a reasonable manner, not interfering with or changing the flow of water otherwise than would an ordinary culvert, except that it retarded the flow more and caused the water to be spread out at the discharge rather than to wash out a channel, was not a violation of rights of owner of land overflowed thereby.—St. Louis Court of Appeals, Missouri, 187 S. W. R., 622.

Ordinances—Conflict With General Laws.

Ward et al v. Markstein.—A municipal ordinance inconsistent with the general policy of the state as declared in its general legislation is void unless expressly authorized by the Legislature, Const. § 89, providing that the Legislature shall have no power to authorize a municipality to pass any law inconsistent with the general laws of the state, not applying, to limit this inhibition to cases where the Legislature had made an act unlawful and a municipality was trying by ordinance to make it lawful.—Supreme Court of Alabama, 72 S. R., 41.

Rights of Abutting Owners—Judgment.

West Davenport Improvement Co. et al v. Theophilus, District Judge.—In a proceeding to restrain the closing of a public street and an interference with plaintiff's rights of access and use necessary in order for plaintiff to have railroad facilities for his ice business, where the defendant alleged that a strip had been dedicated or reserved for railroad purposes for the use of the lot owners in the neighborhood, and where the court found that plaintiff was one of the lot owners and the decree made it mandatory that defendant keep the strip open for the use of plaintiff, and where the Supreme Court, on appeal and on rehearing, directed that the decree should be modified so as to omit from its mandatory holding that part, which, after finding the strip to have been reserved for railroad purposes, found the right to such use to be in plaintiff and required it to be kept open for such use, the modified decree entered below, that the plaintiff had the rights in a strip reserved for railroad purposes by reservation in a plot according to which he purchased, and decreeing that the strip was reserved for railroad purposes, but not finding whether plaintiff had any rights or interest therein for railroad purposes, was in accordance with the opinion and order of the Supreme Court.—Supreme Court of Iowa, 158 N. W. 8, 689.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading English, French and German ones, dealing more or less directly with municipal matters. The index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on municipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

ROADS AND PAVEMENTS.

State:

Directory of State Highway Officials. Names and titles of the chief highway officials in all of the States. 5 pages. Good Roads, August 5. 10 cts.

State Highway Construction in California. Progress of work accomplished under the \$18,000,000 bond issue, and work proposed under the new \$15,000,000 issue. 1,000 words. Engineering and Contracting, August 2. 10 cts.

Reports Year's Progress on New York Highways. Report of Deputy Commissioner H. E. Breed gives cost figures and describes work done in testing road building materials. 1,800 words. Engineering Record, August 26. 15 cts.

The Ohio State Highway Department. Continued from the July issue. This article describes the work of the Bureau of Maintenance and Repair. By George D. Steele. 4 ills., 7,500 words. Better Roads and Streets, August. 15 cts.

Construction:

Preparing Streets of a Large City for Paving. This article takes up in sequence the many operations necessary to paving, such as adjusting underground structures, including sewers, water mains and conduits, removing the old pavement and curb, relaying street car tracks, grading the street, constructing curb and gutter and foundations, and finally the pavement itself. By Daniel J. Hauer. 3 ills., 3,000 words. The Contractor, August 1. 20 cts.

Power Shovels for Grading Streets and Roads. The eighth of a series of articles on street and road grading. The use of power shovels is discussed, showing the advantages and limitations of these machines. By Daniel J. Hauer. 1 ill., 2,500 words. The Contractor, August 15. 20 cts.

Improvement of Highways to Meet Modern Conditions of Traffic. Weight of road traffic has increased considerably, and problem is to improve roads in such manner as to make them capable of carrying heavy weights at high speeds. By W. H. Schofield. 3,000 words. The Surveyor, July 21. 40 cts.

Reducing Hauling Costs in Pavement Construction at Pittsburg, Kansas. Motor trucks were used for hauling National pavement material. Ten round trips of eight miles each were made daily. 1 ill., 600 words. Engineering and Contracting, August 2. 10 cts.

A Well Designed Plant for a Bituminous Macadam Road Job. Describes many machines and devices which have been developed by a Chicago contractor. Time studies and makeup of gangs. 5 ills., 1,200 words. The Contractor, August 1. 20 cts.

Road Drainage and Foundations. Paper read by Major W. W. Crosby before Third Canadian and International Road Congress in which he makes some very useful suggestions covering the subject of drainage and foundations for road work. The paper deals with natural and artificial foundations. 2,400 words. Canadian Engineer, August 3. 15 cts.

Maintenance:

State Highway Maintenance in Maryland. The patrol system of maintenance; experiments with the gang system. Maintenance receipts and expenditures and methods of maintaining and repairing roads. 6,500 words. Better Roads and Streets, August 3. 15 cts.

Four Construction and Thirteen Maintenance Gangs Care For McLennan County Roads. Each unit allotted a given mileage. Highways of recently constructed system, on which more than \$1,000,000 was spent, and dirt roads as well are carefully attended to. By William Davidson, assistant county engineer. 6 ills., 2,000 words. Engineering Record, August 5. 15 cts.

System Applied to Street Management. Reasons that should dictate choice of surfacing. Record of traffic and cost of maintenance. By Will P. Blair. 1,500 words. Southern Good Roads.

Pavements:

The Various Roadway Surfacing. Location and character of available materials and character of traffic and grade are deciding factors. Discusses all types of surfacing. 2,500 words. Southern Good Roads, August. 10 cts.

Standard Pavement Sections and Split Granite Block at Portland, Maine. Describes sections of pavements and gives cost for relaying granite block. 1 ill., 800 words. Engineering & Contracting, August 2. 10 cts.

Repaving of Milwaukee Viaduct. Method of repaving with oak strips and blocks. 4 ills., 750 words. Municipal Journal, August 3. 10 cts.

Annual Report Discusses Manhattan Pavement. Chief Engineer Stern of Manhattan Boro, New York City, records certain changes in specifications. Mortar bed has been adopted for granite block pavement. 1,500 words. Engineering Record, August 19. 15 cts.

Asphalt:

Asphalt Pavement Costs With Municipal Plant. Cost for operating municipal plant at Spokane, Wash. By John W. Cunningham. 1,000 words. Engineering News, August 24. 15 cts.

Mechanical Handling of Asphalt. This article gives a detailed description of a small layout for the handling of asphalt in bulk. Details of construction are shown. By S. G. Talman. 3 ills., 1,400 words. Canadian Engineer, August 3. 15 cts.

Fibered Asphalt for Road Surfacing. Has been used for resurfacing on New York state highways. These are reported to have given satisfaction during period of service, which is about one year. 5 ills., 1,100 words. Municipal Engineering, August. 25 cts.

Bituminous:

Recent Developments in Bituminous Macadam and Bituminous Concrete Pavement. By Arthur H. Blanchard. 3 ills., 3,500 words. The American City, August. 35 cts.

Laying Bituminous Concrete in Baltimore, Md. Old rebuilt concrete mixer is used to combine materials. Other details of organization and construction are given. By Daniel J. Hauer. The Contractor, August 15. 20 cts.

Bituminous Materials Tests for Sheet Asphalt. What tests should be included in sheet asphalt, paving specifications. A discussion of points raised in an alleged attack on the specifications adopted by the A. S. M. I. By Francis P. Smith. 5,000 words. Engineering News, August 3. 15 cts.

Brick:

Recent Advancement in Brick Paving. A discussion of the most improved method of construction, including monolithic and cement-sand bed types. By F. A. Churchill. 5 ills., 2,000 words. Good Roads, August 5. 10 cts.

Sand-Cement Bed and Mortar Bed in Illinois Brick Road Construction. Specifications for both kinds. Sand cushion has been abandoned for use with brick roads. 900 words. Engineering & Contracting, August 2. 10 cts.

Concrete:

Concrete Pavements in Suburban and Rural Districts Near Large Cities. Discusses essentials and selection of a good road. Maintenance cost for all types of pavement. Summary of first cost plus maintenance and interest. By E. W. Stern, Chief Engineer of Highways, Boro of Manhattan. 3,500 words. Concrete, August. 15 cts.

Philadelphia's Concrete Service Test Road. Describes the construction of the various sections, types of bituminous surfaces and specifications. By William H. Connell, Chief Bureau of Highways. 6 ills., 6,000 words. Better Roads and Streets, August. 15 cts.

Inverted Concrete Pavement Construction. Describes small piece of work on land improvement. 4 ills., 400 words. Engineering and Contracting, August 2. 10 cts.

Wayne County Resurfaces Old With New Concrete. Methods employed. 600 words. Concrete, August. 15 cts.

Wear of Concrete Pavements Due to Improper Construction. Incorrect proportioning, insufficient tamping or careless finishing may cause a condition conducive to excessive wear. Discusses these faults. 1 ill., 1,000 words. Engineering & Contracting, August 2. 10 cts.

Granite:

Unusual Practice in the Construction of Granite Block Pavements in Three Cities. Describes the work done in Brooklyn, N. Y.; Baltimore, Md., and Columbus, O. Methods of construction. 7 ills., 1,800 words. Good Roads, August 5. 10 cts.

Resurfacing Old Belgian Block Pavements With Bituminous Surface. Street was cleaned, pavement heated until dry and binder coat of bitumen applied. Sheet asphalt mixture laid on top. Costs. 1,000 words. Engineering & Contracting, August 2. 10 cts.

Gravel:

Graveled Roads. Considers the laying, drainage and maintenance of gravel roads. By Gabriel Henry, Chief Engineer of Highways, Quebec. 3,000 words. Canadian Engineer, August 17. 15 cts.

Low Cost Roads for Moderate Traffic. How New Hampshire builds gravel roads for less than \$4,000 a mile. Methods of staking out roads. 1,250 words. Municipal Journal, August 31. 10 cts.

Macadam:

Construction and Maintenance of Macadam Road. Defines "macadam" and describes the improved types of construction. Maintenance and the effect of motor traffic. By W. W. Crosby. 4,000 words. Southern Good Roads, August. 10 cts.

Penetration Methods With Refined Tar. Abstract of a paper by A. W. Dean, chief engineer, Massachusetts Highway Commission. 1,700 words. Canadian Engineer, August 31. 15 cts.

Thirty Mile Macadam Automobile Road Built Through Maine Woods to Construct Dam. Well maintained gravel road and motor truck prove cheaper than teams or railroad for hauling cement to inaccessible work. 5 ills., 1,500 words. Engineering Record, August 19. 15 cts.

The Destruction of a Macadam Road. Some interesting data dealing with the effect of the size of wheels upon macadam pavement. By T. W. Arnall. 10 ills., 3,000 words. Canadian Engineer, August 24. 15 cts.

Oiling:

Oiled Pavements Smoothed With Scarifier and Scraper. In Riverside, Cal., material is taken from high spots and saved for use in filling in slight depressions. 1 ill., 600 words. Engineering Record, August 19. 15 cts.

Methods and Cost of Oiling Earth Roads in Illinois. Selection of roads for oiling, preparing surface for oiling, applying oil, shipping and handling, pumping and heating. Sanding oil surfaces and oiling sandy roads. Costs of surface oiling. Illinois specifications. 6 ills., 4,500 words. Engineering and Contracting, August 2. 10 cts.

Earth Roads:

Earth Roads Construction in Murray County, Minn. Work done by day labor, using county outfit. Description of road system; organization of outfit. 3 ills., 1,500 words. Engineering and Contracting, August 2. 10 cts.

Finance:

The Determination of Justifiable Cost in Highway Construction. By Edward Smith, former state highway engineer of Idaho. 8,000 words. Better Roads and Streets, August. 15 cts.

Miscellaneous:

Openings in Street Pavements. Preventing them apparently impracticable and methods of control and suggestions for restoring pavements are discussed. Sidewalks and pipe galleries are advocated for underground structure. 1,400 words. Municipal Journal, August 17. 10 cts.

Back-filling Trenches. In New York city the average number of street openings is more than 25,000 a year. It is almost impossible to back fill trenches properly. Suggested practice for back-filling. 1,750 words. Municipal Journal, August 17. 10 cts.

Planning and Organizing for Paving County Roads. Methods used in Vermillion County, Ill., where \$1,500,000 is to be spent in paving 166 miles of road in two working seasons. 3 ills., 2,500 words. Engineering News, August 10. 15 cts.

Guarantees of Pavement on State and Municipal Highways. A continuation of the article appearing in the issue of July 15. By George C. Warren. 1,700 words. The Contractor, August 1. 20 cts.

Some Comparative Tests of the Wearing Qualities of Paving Brick, Concrete, Mortar and Neat Cement. By F. L. Roman. 5 ills., 1,800 words. Municipal Engineering, August. 25 cts.

Street-Car Companies Want Less Crown in Pavements. Intensive study in Chicago gives relation between vehicular and surface traffic and physical condition of streets. 900 words. Engineering Record, August 5. 15 cts.

Combined Sidewalk, Curb and Storm Water Sewer at Ann Arbor, Mich. Describes structural features. 4 ills., 300 words. Engineering and Contracting, August 9. 10 cts.

Kenilworth Avenue Subway, Hamilton. A description of a typical city grade separation work. Notes on waterproofing. Overcoming falsework trouble. 10 ills., 2,500 words. Canadian Engineer, August 24. 15 cts.

SEWERAGE AND SANITATION.**Treatment:**

Sewage Disposal at Caerphilly. Description of new works; arrangement of tanks and filters. 1 ill., 2,000 words. The Surveyor, August 11. 40 cts.

Hydrolytic Sewage Tanks at Luton, England. Describes settling, reduction and hydrolizing chambers arranged in nine compartments of three concentric rings around a central sludge-valve chamber. By J. W. Tomlinson. 5 ills., 3,300 words. Engineering News, August 3. 15 cts.

A Small Sewage Sprinkling Filter with Unique Features. Describes a small filter designed to handle sewage from a pleasure park. Discusses design and gives plans. By R. C. Hardman. 1 ill., 1,100 words. Engineering and Contracting, August 9. 10 cts.

Cleburne's Sewage Disposal Plant. Description of a small plant just completed which consists of Imhoff tanks, sprinkling filters and secondary settling tanks. Dimensions and other details are given for the plant which is designed for 25,000 population. By R. C. Lowry. 3 ills., 1,600 words. Municipal Journal, August 3. 10 cts.

Sheffield Sewage Disposal Work. Experimental work with reference to the purification of sewage by aeration, activated sludge, etc. By John Haworth, manager and chemist. 5,000 words. The Surveyor, July 14. 40 cts.

Experimental Work with Reference to the Purification of Sewage by Aeration, Activated Sludge, etc. Description of the experiments carried on at Sheffield, England. An abstract of a paper by John Haworth. 2,500 words. Canadian Engineer, August 31. 15 cts.

Sewage Treatment Plant. Cook County institutions. Bar screen, grit chamber, Imhoff tank, hypochlorite, contact beds and sludge drying beds. By Burton J. Ashley. 2 ills., 900 words. Engineering News, August 17. 15 cts.

Experience with Fine Grade Filters. Discusses rate of distribution, recovery of beds after rest and life of fine grade filters. From a paper by W. H. Makepeace. 2,000 words. The Surveyor, July 14. 40 cts.

The Sewage Problem. The latest developments in treatment and possibilities for future improvements. From an address by Dr. Sidney Barwise. 3,000 words. The Surveyor, July 14. 40 cts.

Reconstruction of the East End Sewage Disposal Plant, Hamilton, Ont. Gives some details of construction. By E. R. Gray, city engineer. 3 ills., 800 words.

The Canadian Engineer, August 17. 15 cts.

A Preliminary Report Upon Purification of Swimming Pools of the State University of Iowa. By J. J. Hinman, Jr. 4 ills., 1,500 words. Engineering and Contracting, August 9. 10 cts.

Sewers:

Stringham Creek Storm and Sanitary Sewers, Oshkosh. Detail of construction. By D. Whitman. 2 ills., 1,100 words. Concrete, August. 15 cts.

A Sewer System Without Manholes or Records. Describes the system in use in St. Augustine, Fla. Describes method of cleaning sewers, some of which were stopped with roots. By C. E. Henderson, engineer. 1 ill., 1,250 words. Municipal Journal, August 10. 10 cts.

Sewer Construction in Brooklyn. Details of deep trench excavation and bracing for 9½-foot circular brick sewer. Spoil was handled by movable trestle and trolley hoist operated by stationary engines. 3 ills., 1,200 words. Contracting, August. 10 cts.

Some Ideas in Sewer Work. Means adopted to increase the efficiency of the work done by sewer section of the Toronto Department of Works. By W. G. Cameron, district engineer. 4 ills., 1,100 words. Canadian Engineer, August 10. 15 cts.

Methods of Concrete Sewer Construction. Several varieties of design and construction are described. These show the adaptability of concrete to such construction. By J. F. Springer. 8 ills., 4,000 words. Municipal Engineering, August. 25 cts.

Installing Concrete Sewer Lines with Electric Driven Machinery. Describes electric driving cranes, electric excavating cranes and electric pipe laying crane. Portable substations. By L. R. W. Allison. 3 ills., 1,000 words. Concrete, August. 15 cts.

Perform all Work for Double-Deck Sewer from Five Mounted Platforms. Milwaukee interceptors for gravity and pressure flows built in soft material with few men and much equipment. 4 ills., 1,000 words. Engineering Record, August 19. 15 cts.

Proposed Tentative Recommended Practice for Laying of Sewer Pipe. Contains the recommendations of the committee appointed by the American Society for Testing Materials. It covers the preparation of trenches, foundations, etc., for pipe laying and backfilling trenches. 2,200 words. Canadian Engineer, August 17. 15 cts.

Miscellaneous:

Cleaning Up and Improving a Stream Polluted by Sewage and Trade Wastes. Physical features of Neponset river and sanitary conditions. Drainage improvements and methods of preventing pollution. Description of treatment plants. By Harrison P. Eddy. 6,000 words. Engineering and Contracting, August 9. 10 cts.

Long-time New York Rainfall Basis for Sewer Design. First part of an analysis of 45 years of rainfall records in New York city. By O. Hufeland. 2 ills., 3,800 words. Engineering News, August 31. 15 cts.

House Connections as Factor in Infiltration. Discusses amount of leakage into house connections as compared with that into sewers. By W. W. Dixon. 700 words. Engineering and Contracting, August 9. 10 cts.

WATER SUPPLY.**Waterworks:**

Automatic Waterworks for a Small Town. In Milltown, N. J., the operation of pumps is automatic, the electric motors being controlled by the water pressure. The control apparatus is so sensitive that the opening of a hydrant at any part of the pipe line will start the pumps. By Clyde Potts. 3 ills., 1,200 words. Power, August 8. 5 cts.

The Greater Winnipeg Water Supply. Record of work done during 1915, showing the progress that is being made. 5 ills., 500 words. Canadian Engineer, August 10. 15 cts.

Water Supply Development for Seattle. City contemplates system costing \$4,000,000. Description and estimating costs of proposed work. 800 words. Engineering and Contracting, August 9. 10 cts.

The New Orleans Water Works. Describes the waterworks system, water sterilization and purification; pumping stations. 3,500 words. Fire and Water Engineering, August 9. 10 cts.

Waterworks Plant at York, Pa. 5 ills., 3,600 words. Fire and Water Engineering, August 16. 10 cts.

A New Raw Water Supply for the City of McKeesport. Description of the new supply system. By B. C. Truax, chemist. 3,500 words. Fire and Water Engineering, August 9. 10 cts.

Purification:

Sterilizing Water and Cleaning Mains. Information from several hundred cities concerning methods used by them for reducing bacterial contents. Corrosion of water mains and methods of cleaning. 4 pages. Municipal Journal, August 10. 10 cts.

Automatic Coagulant Feeding Device for Mechanical Filters. This is an illustrated description of an apparatus based upon using a saturated solution of coagulant made from aluminum sulphate or ferrous sulphate, depending upon the water supply. By M. F. Newman, Engineers' Society of Western Pennsylvania. 2 ills., 1,100 words. Canadian Engineer, August 31. 15 cts.

Pipe Lines:

Why American Water Pipes Are Beat. British, Canadian and American products compared. What an experience in Egypt brought out as to manufacture and packing. By Percy B. Donald. 9 ills., 2,500 words. Iron Age, August 24. 20 cts.

Hinged Joints in Mains Prevent Shutting Off of Service to Consumers During Bridge Moving. Shifting of bridge was a slow process and would otherwise have made it necessary to discontinue service for several hours. No trouble was experienced with mains during actual moving. 3 ills., 500 words. American Gas Light Journal, August 7. 10 cts.

The Great Mistake in the Distribution Systems of Some Cities Has Been Lack of Foresight. Advocates laying mains on each side of street where car tracks are laid. From a paper by P. S. Lamb. 1,100 words. American Gas Light Journal, August 28. 10 cts.

Plans and Records for Water Distribution Systems. Mains record register; valve location books; plotting mains on maps. By William P. Walker. 3 ills., 2,000 words. Canadian Engineer, August 10. 15 cts.

Reservoirs:

Sealing Seattle's Reservoir. Recommendations of four engineers for making watertight a reservoir constructed in porous gravel and covering about 200 acres. Discusses the effectiveness of silting, use of asphalt, etc., and gives estimated cost for the various methods. 3 ills., 3,200 words. Municipal Journal, August 31. 10 cts.

Pumping:

Condition and Rates of Town Water Supply Pumping in Iowa. Gives data on 37 city water supply pumping installations. 1,000 words. Electrical World, August 26. 10 cts.

The Selection, Installation and Test of a 1,000,000 gallon centrifugal pump. From a paper by S. R. Blakeman. 4,000 words. Fire & Water Engineering, August 2. 10 cts.

Meterage:

Setting Water Meters at Terre Haute, Ind. This article shows what can be done when plans are laid in advance and worked out in proper detail. 1 ill., 2,500 words. Municipal Engineering, August. 25 cts.

Setting Meters in Wilmington. Method of installing and average cost. Standard meter box is described. 1 ill., 1,000 words. Municipal Journal, August 17. 10 cts.

Venturi Meters Inaccurate on Lively Lines. Non-uniform flow in pipe line may reduce Venturi coefficient from 0.99 to 0.90. By Allen Hazen. 800 words. Engineering News, August 17. 15 cts.

Miscellaneous:

Flow of Water Into Wells; Approximate Theory. Gives formula for finding rate of flow, etc., from open wells. By N. Werenskiold. 2 ills., 1,100 words. Engineering News, August 10. 15 cts.

Tunnel Grouting in Brooklyn End of Catskill Aqueduct. Methods of controlling water inflow while placing concrete lining and of grouting to stop subsequent leaks are described. Costs are given. By O. W. Meyers. 5 ills., 4,000 words. Engineering News, August 2. 15 cts.

STREET LIGHTING AND POWER.**Street Lighting:**

The Photography of Lighting Installations. Discusses the important factors to be considered in making successful photographs of street lighting systems or of interiors or exteriors illuminated by artificial light sources. By W. E. Brewster. 10 ills., 1,200 words. Lighting Journal, August. 10 cts.

Incandescent Street Lighting Regulating Apparatus. This article outlines briefly the theory of those regulators designed to control constant current circuits. The effect of different loads is pointed out. A knowledge of the theory and operating characteristics of constant current transformers will help in selecting the most efficient and desirable system for series street lighting. By H. H. Reeves. 17 ills., 2,500 words. General Electric Review, September. 20 cts.

Power: Power Development in Saskatchewan. Deals with the hydro-electric possibilities in the province of Saskatchewan. From a paper by E. Hanson. 2,500 words. Canadian Engineer, August 3. 15 cts.

Diesel Engine Operation and Up-keep Data. Records of several successful installations in the southwest. By L. W. W. Morrow. 4,000 words. Electrical Review, August 19. 10 cts.

Diesel Oil Engines. Description of the installation of these engines in a water and light plant in England. By F. Reginald Phipps. 4 ills., 4,000 words. The Surveyor, August 11. 40 cts.

Miscellaneous: The Capacity of Chimneys. Factors that influence the capacity of chimneys are explained and formulas for capacity by many authorities are given. By Geo. A. Orrok. 1 ill., 2,000 words. Power, August 22. 5 cts.

A Trial Concentric Wiring Installation at Chicago. Some details of the equipment just installed in a small building by the Commonwealth Edison Company. 3 ills., 1,000 words. Electrical World, August 12. 10 cts.

Maximum Returns Cannot be Expected From Gas-Electric Plants if Lighting is Neglected. 4,000 words. American Gas Light Journal, August 21. 10 cts.

Experience With the Electric Heating of Dwellings. Figures from installation of water and oil circulating systems tried at Seattle. The outlook for electric house heating as an off peak load where cheap water power is available. By J. D. Ross, Superintendent of Lighting, Seattle, Wash. 6 ills., 2,200 words. Electrical World, August 26. 10 cts.

Central Station Heating With Special Reference to Minnesota. By John V. Martins. 3 ills., 1,600 words. The American City, August. 35 cts.

FIRE.

Protection: Camden's All-Motor Fire Department. Of the 25 pieces of motor-driven apparatus, 11 of them are electric, while horses are entirely eliminated. Cost of gasoline, oil and electric power is given for several pieces of apparatus. Fire alarm system. 6 ills., 1,400 words. Municipal Journal, August 24. 25 cts.

The Chicago Fire Department. Plan of organization and duties of each official. Criticism of fire hydrant service. Fire prevention methods. By G. W. Rutherford. 2,800 words. Municipal Journal, August 24. 25 cts.

Fire Fighting Equipment and Methods in Providence. Describes the equipment of the department and gives an outline of the present status and plans for the future. By Reuben Weekes, Chief. 5 ills., 1,200 words. The American City, August. 35 cts.

Providence Fire Department: A description of it, what it has, what it does and what it costs. 9 ills., 3,000 words. Fireman's Herald, August 19. 5 cts.

The Providence Fire Department. Description of the department and its equipment. 3 ills., 1,200 words. Fire and Water Engineering, August 23. 10 cts.

Features of the District of Columbia Fire Service. Abstract of report by National Board of Fire Underwriters. 3,000 words. Fire & Water Engineering, August 16. 10 cts.

The Passaic Fire Department. Describes apparatus, equipment and methods. 2,000 words. Fire & Water Engineering, August 9. 10 cts.

Fire Department of Milwaukee. A description of the work of the department during the past year, its equipment, etc. 1,200 words. Fire and Water Engineering, August 2. 10 cts.

White Plains Fire Department. Abstract of report of National Board of Fire Underwriters. 2,000 words. Fire and Water Engineering, August 16. 10 cts.

The Rochester Fire Department. A description of the department as abstracted from the annual report. 2,000 words. Fire and Water Engineering, August 16. 10 cts.

Watertown Fire Department. A short description of the department and its

operation. Cost of motor apparatus maintenance. 700 words. Municipal Journal, August 3. 10 cts.

Miscellaneous: Fire Department Statistics of Cities of 5,000 and Over. Gives horse and motor apparatus in service, feet of hose and kind of fire alarms. 4 pages. Fire & Water Engineering, August 23. 10 cts.

Days off for Firemen. A report of the committee on municipal and metropolitan affairs of the Boston Chamber of Commerce concerning the proposed "one day off in three" schedule for the Boston Fire Department. 3,000 words. The American City, August. 35 cts.

Fire Drills Organized by Firemen. Under the direction of uniformed firemen drills have been instituted in schools and factories. Text of the fire drill regulations. 1,750 words. Fireman's Herald, August 12. 5 cts.

New York Fire College Extension Course. Questions presented and answers as given officially. Fireman's Herald, July 5, 12, 19 and 26. 5 cts. each.

Rescue Work of the Pittsburgh Fire Department. Describes work of the rescue squads. 2 ills., 800 words. The American City, August 1. 35 cts.

MOTOR VEHICLES.

Under What Conditions Are Motor Trucks a Good Investment? How much will they save and under what conditions are they efficient? What use is being made of them? Answers by representative truck users. 4,000 words. Concrete, August. 15 cts.

Motor Trucks in State Road Work. A heavy traffic road is resurfaced with 2-inch asphalt blocks on a 5-inch concrete base, with hillside brick on the heavier grades. Motor trucks haul material 7 to 9 miles. Detailed cost of motor truck operation is given and is compared with cost of hauling by horses over same road seven years before. 6 ills., 2,000 words. Municipal Journal, August 10. 10 cts.

Motor Vehicles for Municipal Work. Discussion at conference of cleansing superintendents dealing with the subject of street cleaning by motors and street watering by electric vehicles. Collecting garbage; using motor sweepers. 3,000 words. The Surveyor, July 28. 40 cts. 3,000 words. The Surveyor, August 4. 40 cts.

Motor Trucks on an Uphill Haul. Motor trucks are used for short distance carrying. In another place a truck hauled 12 loaded cars when used as a locomotive. 2 ills., 1,200 words. The Contractor, August 1. 20 cts.

Use Motor Truck to Dig and Backfill Trench for 14,000 Foot High Pressure Main to U. S. Radio Station. Tamping done by driving truck over new fill. Cheap and satisfactory work the result. Improvements on methods employed will effect further economy in excavation. By D. J. Young. 6 ills., 1,000 words. American Gas Light Journal, August 28. 10 cts.

Conserving the Minutes in Motor Truck Operation. The first of a series of articles written with a view to instructing contractors in the proper operation of motor trucks. By A. P. Lee. 5 ills., 3,000 words. The Contractor, August 15. 20 cts.

Three Million Automobiles in the United States. Gives registration in all the states. Over a half million gain since January 1st, 1916. 4 ills., 2,500 words. The Automobile, August 17. 10 cts.

STREET CLEANING AND REFUSE DISPOSAL.

Street Cleaning: Results Obtained in Street Cleaning by Motors. A resume of experience in Glasgow with mechanically propelled vehicles, the fuel used being petrol. Costs of motor sweeping machines and work done. By W. Greig, Cleansing Superintendent. 4,500 words. The Surveyor, July 21. 40 cts.

Los Angeles Motor Sprinkler and Flusher. Description of machine which has proved economical. 1 ill., 500 words. Municipal Journal, August 10. 10 cts.

Some Results of the Use of Steam Tractors in Cleansing Work at Cardiff. These machines have been in use since 1904. Conclusions drawn from their use. By W. Harpur, city engineer. 2,000 words. The Surveyor, July 21. 40 cts.

Street Watering With Electric Vehicles. Describes the work done in Black-

pool and gives cost by motor vehicles in 1916 and by horse-drawn vehicles in 1915. Improved method is more economical. By James Bee. 1 ill., 3,000 words. The Surveyor, July 21. 40 cts.

Street Sprinkling in a Small City. Rochester, Minn., sprinkles streets at a cost much less than by the contract system. Costs and equipment are given. 800 words. Engineering & Contracting, August 2. 10 cts.

Garbage Disposal: Results Obtained by Electric Vehicles in the Removal of House Refuse. Discusses the advantages of electric, steam-driven and gasoline-driven vehicles. Cost and operation of electric vehicles. By J. Terry. 4,000 words. The Surveyor, July 21. 40 cts.

Analytical Study of Garbage, Rubbish and Ashes. An abstract of a report by Irwin S. Osborn on waste removal at Washington, D. C. 2,000 words. Engineering News, August 17. 15 cts.

Some Results of Analysis of Garbage and Waste. From report of I. S. Osborn on waste removal at Washington, D. C. 1 ill., 1,100 words. Engineering News, August 24. 15 cts.

Sale of Waste Material. Enumerates many materials which cities could collect and sell at a profit and gives instructions for grading. 1,500 words. Municipal Journal, August 31. 10 cts.

CITY PLANNING.

Obligatory Town Planning. By H. R. Aldridge and Harold Shawcross. 15,000 words. Journal of the Municipal and County Engineers, August. \$1.00.

Building Restriction in New York. Regulations recently adopted which segregate uses of property and restrict height of buildings and area of land occupied thereby. Municipal Journal, August 10. Height limitations by districts. Area of lot which can be covered by building. 1 ill., 4,200 words. Municipal Journal, August 17. 10 cts. each.

Building Districts Defined for New York City. Height and use limitations fixed by new law. Maps of Boro of Manhattan indicate restrictions in detail. 2 ills., 1,000 words. Engineering Record, August 5. 15 cts.

GOVERNMENT AND FINANCE.

Finances of Commission Government. A comparison of the finances of 24 cities of more than 30,000 population, under commission form of government and under mayor and council form. 1,200 words. Municipal Journal, August 3. 10 cts.

Municipal Supply Department—Audit and Inspection. How to inspect municipal supplies honestly without excessive expense is a problem. Systems of handling these problems are worked out in this article. By H. M. Foster, 5,000 words. Municipal Engineering, August. 25 cts.

Depreciation as Applied to Valuation. Normally, in well maintained railroads, no indication of withdrawal of capital is shown and no deductions should be made. By R. B. Shepard, Jr. 1,500 words. Engineering Record, August 12. 15 cts.

How One California City Dealt With Its Unemployed. Municipal labor bureau procured work for some and lodgings were furnished for others. By Frederick C. Mills. 1,600 words. Pacific Municipalities, August. 25 cts.

The Success of An Unique Experiment by New York State Cities. This article describes the New York State Bureau of Municipal Information, which is operated on co-operative basis by 57 cities of the state. By William P. Capes, Director. 1,800 words. Canadian Engineer, August 3. 15 cts.

Compensation in Kind Involved in, Hartford Water Case. United States Supreme Court holds that private property can be condemned for compensation purposes in Hartford water rights case. By C. M. Saville. 2,400 words. Engineering News, August 10. 15 cts.

Importance of Cost Data on Day Labor Work. Detect points of excessive loss and prove to taxpayers the efficiency of work done. They also demonstrate the value of the foreman in different lines of work. Results and methods in Victoria, B. C. By A. E. Foreman, Assistant City Engineer. 2 ills., 8,000 words. Municipal Journal, August 17. 10 cts.

A Simple and Efficient Cost Keeping System for Concrete Construction. 5,000 words. Engineering & Contracting, August 30. 10 cts.

TRAFFIC AND TRANSPORTATION.

Rerouting a Traffic of Nine Cars a Minute. How the Public Service Railway solved the problem of handling traffic of exceptional density by means of a new terminal in Newark. By H. C. Donecker, Assistant General Manager. 9 ills., 3,000 words. Electric Railway Journal, July 29. 10 cts.

Fare Zones Adjusted in Maine. Maine Commission authorizes a 2-cent and an 8-cent zone on the Lewiston, Augusta & Waterville Street Railway. 1 ill., 4,000 words. Electric Railway Journal, July 29. 10 cts.

Study of Chicago's Congested Traffic. The report of the Board of Supervising Engineers on possibilities of improving street railway service involves an analysis of the causes of the congested conditions and their remedies. 1 ill., 6,500 words. Electric Railway Journal, July 29. 10 cts.

Chicago's Congested Streets. The only solution for the problem of providing more surface transportation is the utilization of every means for passing cars through the narrow streets. 5 ills., 3,000 words. Electric Railway Journal, August 5. 10 cts.

Long Rides for a Nickel. Examination of single fare areas of some American cities shows surprising number of 8 and 10-mile rides. By D. J. McGrath. 24 ills., 1,200 words. Electric Railway Journal, August 5. 10 cts.

MUNICIPAL WORKS.

Public Utilities of Flume, Hungary. Power plant supplies current to municipal water works and street railway system. Part of the power is derived from the refuse incinerator. 1,200 words. Municipal Journal, August 3. 10 cts.

BRIDGES AND DAMS.

Bridges:

Painting and Maintaining Steel Highway Bridges. Discusses painting and reviews the many details of maintenance which must be considered. By Geo. Hogarth. 2 ills., 3,500 words. The Municipal World, August. 15 cts.

Popolopen Steel Arch in the Hudson Highlands. High level highway bridge completes Hudson River road from opposite New York to West Point. 1 ill., 500 words. Engineering News, August 24. 15 cts.

Steel Spans and Concrete Arches Combined to Form Unusual Bridge at 90th Street, Cleveland. Spans crossing Holton avenue and railroad tracks are so limited by clearance requirement that complex skew construction is necessary. 6 ills., 1,500 words. Engineering Record, August 12. 15 cts.

Three-Hinge Arch Highway Bridge Built in Place at Low Cost. Describes the work of construction and gives details and sections. By Edward N. Sheffield. 3 ills., 1,000 words. Concrete, August. 15 cts.

Concrete Side-Hill Viaduct for a Brick Highway. Unique way of caring for sliding highway on side-hill in Cuyahoga county, O. 1 ill., 600 words. Engineering News, August 24. 15 cts.

Types of Overflow Bridges Used in McLennan County, Texas. Describes bridges constructed in 1914 and 1915 in connection with a system of roads. Discusses design and cost. By Wm. C. Davidson. 13 ills., 4,000 words. Engineering & Contracting, August 23. 10 cts.

The Construction of Highway Bridges. Some practical points regarding the selection of type of bridge and manner of handling construction. By L. E. Allen. 2,600 words. Canadian Engineer, August 10. 15 cts.

A Plate Girder Cantilever Bridge. Describes a steel bridge of novel type at Salamanca, N. Y. By Arthur G. Hayden. 4 ills., 900 words. Engineering News, August 10. 15 cts.

Mission Bridge in Canadian Northwest. Designed as Adornment of its Location. Special false work scheme saves lumber. General description of bridge. By J. F. Greene, bridge engineer of Calgary. 2 ills., 1,200 words. Engineering Record, August 12. 15 cts.

Improving the Appearance of Chicago River Bridges. 3 ills., 900 words. Engineering News, August 10. 15 cts.

South Cantilever Arm of Quebec Bridge Completed. This arm, which contains 13,000 tons of steel, was erected in 92 days. Description of equipment and methods. By A. J. Meyers. 10 ills., 4,700 words. Engineering News, August 17. 15 cts.

South Cantilever Arm, Quebec Bridge. This article contains interesting details concerning the building of the south cantilever arm of the Quebec bridge together with some facts regarding the progress of the work done during the present season. By A. J. Meyers, chief draftsman. 4 ills., 2,500 words. Canadian Engineer, August 17. 15 cts.

Theory of Displacements Applied to Analysis of Suspension Bridges: Influence lines drawn for horizontal component of cable tension and for shear and moment in stiffening truss. By C. S. Whitney. 3 ills., 2,200 words. Engineering Record, August 19. 15 cts.

Dams:

Arched Gravity Dams to be Built at Lower Otay and Barret Sites. San Diego city council accepts recommendations and report of Engineer O'Shaughnessy for immediate construction of two dams. 1 ill., 1,800 words. Engineering Record, August 12. 15 cts.

MATERIALS OF CONSTRUCTION.

The Nation's Brick Statistics. A brief resume of the report of the U. S. G. S. of the clay working industries for 1915. 2,000 words. The Clay Worker, August. 10 cts.

Conditions of Iron in the Old Keokuk Bridge. A study in depreciation and obsolescence. Condition of bridge 45 years old across Mississippi river. By G. C. Hinckley. 2 ills., 2,800 words. Engineering News, August 31. 15 cts.

New Specifications for Portland Cement. By George D. Steele. 2,000 words. Better Roads and Streets, August. 15 cts.

Pneumatic Concreting and Its Development. Summarizes early invention in transporting concrete through pipe, trouble with clogging and lack of flexibility, discovery of means to prevent clogging while using a small discharge pipe, and the development of a mixing-and-conveying unit. By J. H. Graham. 2 ills., 1,100 words. Engineering News, August 31. 15 cts.

Forms for Concrete Work. Abstract of paper presented at concrete institute. Discusses design of concrete forms and materials suitable for construction. Tables of spacings of spans and girts. By R. A. Sherwin. 4,700 words. Canadian Engineer, August 17. 15 cts.

Catskill Aqueduct Concrete Forms. Describes the important development in the design and use of forms in the construction of 50 miles of concrete tunnels built in open trench. From an article by A. D. Flinn. 2 ills., 1,800 words. Contracting, August. 10 cts.

MISCELLANEOUS.

Methods and Cost of Reproducing and Reducing Engineering Drawings. Describes briefly some processes in use. Gives drafting hints. Production of drawings. By J. X. Cohen. 6,000 words. Engineering & Contracting, August 30. 10 cts.

Minor Drafting Room Devices. Fadeless blue prints; flattening rolled drawing; preventive for warping drawing boards; substituting revised details by photograph. 3 ills., 1,500 words. Engineering & Contracting, August 30. 10 cts.

Increasing Drafting Room Efficiency by Improved Furniture Design and Arrangement. 3 ills., 600 words. Engineering & Contracting, August 30. 10 cts.

Loose-Leaf Filing System for City Surveys. System installed in San Francisco after destruction of records in San Francisco fire of 1906. By James M. Owens. 5 ills., 1,300 words. Engineering News, August 24. 15 cts.

Methods and Cost for Making a Snow Survey for an Irrigation System. A survey was made to determine the amount of snow and its moisture content. Description of data, method of making survey, cost and value of survey. 3 ills., 1,800 words. Engineering & Contracting, August 30. 10 cts.

Water Evaporation Studies by Weather Bureau. Proposed studies of existing data and establishment of 25 stations. Standard station and evaporating pan described. By B. C. Kadel and C. Abbe, Jr. 3 ills., 900 words. Engineering News, August 3. 15 cts.

Municipal Day Labor in Flint. Nearly a half million dollars worth of paving and sewerage work was completed within the past year. Value of unit cost records in securing efficiency and economy. 1,100 words. Municipal Journal, August 31. 10 cts.

Carrying on a Large Steam Shovel Ex-

cavation Job. Grading for an abattoir building and yard necessitates cut of 25 feet through earth and rock. Critical comment on work. Continuous operation of equipment shown to be necessary for economy. By Daniel J. Hauer. 1 ill., 1,200 words. The Contractor, August 15. 20 cts.

Steam Shovel Requires Only 8 Feet of Clearance. Excavation in connection with double tracking street railway. 2 ills., 800 words. Electric Railway Journal, July 29. 10 cts.

Washington Systematizes Sub-surface Mapping. Municipal department and public utilities co-operate in making permanent records of underground structures. By A. E. Phillips, superintendent, sewer department. 1 ill., 1,700 words. Engineering Record, August 26. 15 cts.

Relation Between Engineers and Contractors. This relation has materially changed in the last few years, owing to the great development in modern engineering. Both are now usually technical men. By J. W. Rollins. 2,500 words. Canadian Engineer, August 10. 15 cts.

Procedure in Making Electrolysis Surveys. Deals with the methods followed in examining underground pipe for the detection of electrolysis. By Burton McCollum and G. H. Ahlborn. 750 words. Canadian Engineer, August 17. 15 cts.

Methods of Removing Stumps by Blasting. Describes methods of placing charges for various kinds of stumps and soils. By Thomas M. Knight. 4 ills., 1,000 words. Engineering & Contracting, August 16. 10 cts.

Well Drilling in Modern Quarrying. Discusses advantages of various methods of drilling. 1,500 words. Engineering & Contracting, August 16. 10 cts.

BOOK REVIEW

THE PLANNING OF THE MODERN CITY. By Nelson P. Lewis. 413 pages. Profusely illustrated. John Wiley & Sons. Price \$3.50.

The author is chief engineer of the Board of Estimate and Apportionment of New York City, and has written a considerable number of articles on the subject of city planning and papers for each of the annual National Conferences on City Planning. In this book he has devoted his discussions "almost entirely to the engineering aspects of city planning, or to city planning as an engineering problem or group of problems." He defines city planning as "the exercise of such foresight as will promote the orderly and slightly development of a city and its environs along rational lines with due regard for health, amenity and convenience and for its commercial and industrial advancement."

The matter treated of is divided into chapters on "Elements of a City Plan," "The Transportation System," "The Street System," "Parks and Recreation Facilities," "Public Buildings and Civic Centers," "The Economic Value of a City Plan," "The Industrial Town or District," "Street Traffic," "Street Details—Utility and Adornment," "The Railroad in Its Relation to the Street System," "Restrictions," "The Environs of the City," "Garden Cities," "City Planning Legislation," and a few others of a more or less general nature. While the book deals with the engineering aspects of city planning, it is not written in what might be called the technical style or one professing to give simply facts baldly stated, but is an entertainingly written disquisition of the several branches of the subject,

(Continued on page 337.)

NEWS OF THE SOCIETIES

Calendar of Meetings.

Sept. 12-15.—ATLANTIC DEEPER WATERWAYS ASSOCIATION. Annual meeting, Philadelphia, Pa.

Sept. 13.—CENTRAL FLORIDA HIGHWAY ASSOCIATION. Annual meeting, Fort Myers, Fla.

Sept. 13-15.—NEW ENGLAND WATER WORKS ASSOCIATION. Convention, Portland, Me. Secretary, Willard Kent, Narragansett Pier, R. I.

Sept. 13-14.—CANADIAN PUBLIC HEALTH ASSOCIATION. Annual convention, Quebec, Que. Acting Secretary, Dr. Duncan Anderson, Toronto, Ont.

Sept. 13-15.—WASHINGTON STATE ASSOCIATION OF COUNTY COMMISSIONERS. Annual meeting, Tacoma, Wash. Secretary, J. C. Hansen, Port Angeles, Wash.

Sept. 14-15.—WISCONSIN CHIEFS OF POLICE ASSOCIATION. Annual meeting, Milwaukee, Wis. J. T. Jassen, Chief, Milwaukee Fire Department.

Sept. 18-20.—ILLUMINATING ENGINEERING SOCIETY.—Annual Convention, Philadelphia, Pa. Asst. Secretary, C. D. Fawcett, 29 West 39th street, New York City.

Sept. 19-21.—LEAGUE OF IOWA MUNICIPALITIES. Nineteenth annual meeting, Dubuque, Ia.

Sept. 20-22.—MASSACHUSETTS STATE FIREMEN'S ASSOCIATION. Annual convention, Gloucester, Mass. Secretary, D. Arthur Burt.

Sept. 26.—NATIONAL SMOKE PREVENTION ASSOCIATION. Eleventh annual meeting, St. Louis, Mo. Secretary, Frank A. Chambers, Smoke Department, Chicago, Ill.

Sept. 26-28.—LEAGUE OF VIRGINIA MUNICIPALITIES. Annual meeting, Clifton Forge, Va. Secretary, Luther C. Brinson, Portsmouth, Va.

Oct. 2-6.—PLAYGROUND AND RECREATION ASSOCIATION OF AMERICA. Congress, Grand Rapids, Mich. Secretary, H. S. Braucher, 1 Madison avenue, New York City.

Oct. 6.—NATIONAL PAVING BRICK MANUFACTURERS' ASSOCIATION. Study and conference, Deming Hotel, Terre Haute, Ind. Secretary, Will P. Blair, Cleveland, O.

Oct. 9-11.—NATIONAL HOUSING ASSOCIATION. Annual meeting, Providence, R. I. Secretary, Lawrence Veller, 105 East 22d St., New York City.

Oct. 9-13.—AMERICAN ELECTRIC RAILWAY ASSOCIATION. Annual convention, Atlantic City, N. J. Secretary, E. B. Burritt, 8 West 40th street, New York City.

Oct. 9-13.—AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS. Twenty-third Annual Convention, Robert Treat Hotel, Newark, N. J. Secretary, Charles Carroll Brown, 702 Wulsin Building, Indianapolis, Ind.

Oct. 10-11.—CENTRAL STATES DIVISION, AMERICAN WATERWORKS ASSOCIATION. Twentieth annual convention, Hollenden Hotel, Cleveland, O. Secretary, R. P. Bricker, Shelby, O.

Oct. 10-12.—AMERICAN ASSOCIATION OF PARK SUPERINTENDENTS. Secretary, R. W. Cotterill, Seattle, Wash.

Oct. 10-15.—LEAGUE OF CALIFORNIA MUNICIPALITIES. Annual meeting, Visalia, Cal. Secretary, H. A. Mason, Pacific Bldg., San Francisco, Cal.

Oct. 11.—UNION OF BRITISH COLUMBIA MUNICIPALITIES. Annual convention, Vernon, B. C. Secretary, Ex-Reeve H. Bose, Surrey Center, B. C.

Oct. 11-13.—LEAGUE OF KANSAS MUNICIPALITIES. Annual meeting, Independence, Kan. Secretary, C. H. Talbot, University of Kansas, Lawrence, Kan.

Oct. 12-14.—LEAGUE OF WASHINGTON MUNICIPALITIES. Annual convention, Everett, Wash. Secretary, Dr. Herman A. Brauer, University of Washington, Seattle, Wash.

Oct. 13, 14.—SOCIETY FOR STREET CLEANING AND REFUSE DISPOSAL. Annual convention, Street Cleaning Department Building, New York City. Secretary, J. R. Buchanan, Municipal Bldg., New York City.

Oct. 16-21.—NATIONAL SAFETY COUNCIL. Fifth Annual Safety Congress, Detroit, Mich. Secretary, W. H. Cameron, Continental and Commercial Bank, Chicago, Ill.

Oct. 17-20.—AMERICAN GAS INSTITUTE. Annual meeting, Chicago, Ill. Secretary, G. G. Ramsdell, New York City.

Oct. 18-19.—LEAGUE OF MINNESOTA MUNICIPALITIES. Annual convention, Red Wing, Minn. Secretary, Richard R. Price, University of Minnesota, Minneapolis, Minn.

Oct. 24-27.—AMERICAN PUBLIC HEALTH ASSOCIATION. Annual Convention, Cincinnati, O. Secretary, Prof. Selikar M. Gunn, Boston, Mass.

Oct. 28-29.—LEAGUE OF TEXAS MUNICIPALITIES. Annual convention, Hillboro, Tex. Secretary, Prof. H. G. James, University of Texas, Austin, Tex.

Nov. 15.—ILLINOIS MUNICIPAL LEAGUE. Annual convention, Urbana, Ill. Secretary, John A. Fairlie, University of Illinois, Urbana, Ill.

Nov. 15-16.—NATIONAL CONFERENCE ON UNIVERSITIES AND PUBLIC SERVICE. Third annual conference, Philadelphia, Pa. Secretary, Edward A. Fitzpatrick, Box 380, Madison, Wis.

Nov. 16-18.—FIRE MARSHALS' ASSOCIATION OF NORTH AMERICA. Annual convention, Nashville, Tenn.

Nov. 20-22.—MONTANA MUNICIPAL LEAGUE. Annual meeting, Lewiston, Mont. E. S. Judd, City Clerk, Billings, Mont.

Nov. 20-23.—CITY MANAGERS' ASSOCIATION. Third annual convention, Springfield, Mass. Secretary, O. E. Carr, Niagara Falls, N. Y.

Nov. 21.—MASSACHUSETTS CIVIC LEAGUE.—Conference and annual meeting, Springfield, Mass. Secretary, Edward T. Hartman, 3 Joy Street, Boston, Mass.

Nov. 22, 23.—MUNICIPAL RESEARCH WORKERS.—First annual conference, Springfield, Mass. L. D. Upson, Program Committee, Detroit, Mich.

Nov. 22, 23.—TRAINING SCHOOL FOR PUBLIC SERVICE. Special conference, Springfield, Mass. Charles A. Beard, Supervisor, 261 Broadway, New York.

Nov. 23, 24.—CIVIC SECRETARIES' CONFERENCE. Annual conference, Springfield, Mass. Secretary, Howell Hart, Milwaukee, Wis.

Nov. 23-24.—MASSACHUSETTS FEDERATION OF PLANNING BOARDS. Annual convention, Springfield, Mass. Secretary, Arthur C. Comey, Cambridge, Mass.

Nov. 23-25.—NATIONAL MUNICIPAL LEAGUE. Annual convention, Springfield, Mass. Secretary, Clinton Rogers Woodruff, 705 North American Building, Philadelphia, Pa.

Dec. 27-30.—AMERICAN ECONOMIC ASSOCIATION. Annual meeting, Columbus, Ohio. Secretary, A. A. Young, Ithaca, N. Y.

Dec. 27-30.—AMERICAN STATISTICAL ASSOCIATION. Annual meeting, Columbus, O. Secretary, Carroll W. Doten, 491 Boylston street, Boston, Mass.

Dec. 28-31.—AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Annual meeting, New York City. Secretary, L. O. Howard, Smithsonian Institute, Washington, D. C.

Jan. 20, 1917.—WESTERN PAVING BRICK MANUFACTURERS' ASSOCIATION. Kansas City, Mo. Secretary, G. W. Thurston, 416 Dwight Bldg., Kansas City, Mo.

Jan. 23-25, 1917.—AMERICAN WOOD PRESERVERS' ASSOCIATION.—Annual meeting, New York City. Secretary, F. J. Angler, B. & O. Mt. Royal Sta., Baltimore, Md.

Feb. 5-12, 1917.—AMERICAN ROAD BUILDERS' ASSOCIATION. Seventh American Good Roads Congress and Eighth National Good Roads Show, Mechanics' Hall, Boston, Mass. Secretary, E. L. Powers, 150 Nassau street, New York City.

League of American Municipalities.

The twentieth annual convention of the League of American Municipalities was held at the Robert Treat Hotel, Newark, N. J., September 6-9. The convention was formally opened at half past eleven Wednesday morning,

with mayor Behrman, president of the league, in the chair. Mayor Raymond of Newark welcomed the convention to the city. He said in part:

"The rapidly increasing needs of growing cities demand continually the exercise of new governmental powers. But the one great obstacle in the way of the city's efforts in the direction of a healthful functional activity is, that in most instances, the city is the serf of the state. That the city should be emancipated from state legislative domination is manifest; at least, to the extent of being privileged to exercise a power adequate to deal directly and unhampered with matters of purely local concern; to simplify the form of city government, to render it more responsive to the needs of the people and directly responsible to the people. Then and then only shall the city be competent to co-ordinate its administration and to pass and enforce measures to bring about the conditions so essential to its combined growth and development."

Prison reform and infantile paralysis were themes discussed at the Thursday morning session of the league. Warden Thomas Mott Osborne of Sing Sing Prison spoke of prison conditions in general and explained and defended, in particular, his trust system in the treatment of convicts.

New York's experience with infantile paralysis was detailed by Health Commissioner Haven Emerson of that city. "Infantile paralysis is not a good name," said Dr. Emerson. "The disease occurs more often in non-paralytic forms than in paralytic forms, so at first there was difficulty in diagnosis. We had to teach the doctors to watch for all the symptoms of the disease."

With the use of a chart Dr. Emerson pointed out that for some reason people failed to detect cases on Sundays. In response to a question he said he had no knowledge that this epidemic came from one in Europe. Apparently it originated in New York, he said. Sometimes the virus will develop only sporadic cases, at other times an epidemic. Infantile paralysis has long been known in the Scandinavian countries. It is obvious that the epidemic will be over in two or three weeks, the city's confidence in this, the commissioner said, being evidenced in the decision to open the New York schools September 25.

"How grave the problem of crime is," said Warden Osborne, "I believe is not appreciated by even the majority of those whose attention is given to municipal problems. The 1910 census shows there were 2,900 institutions of correction in the United States. Out of these 476,000 persons come every year to resume their places in society. It is important to learn what the temper of these persons is, whether they are prepared to become good citizens or to war upon society."

Other speakers at the morning session were Mr. Cattell and William M. Seabury, general counsel of the recent-

ly organized National Association of Motion Picture Industries. Mr. Cattell urged the mayors present not to be afraid to spend money in municipal improvements, declaring that all such improvements eventually return a large interest on the investment. That has been Philadelphia's experience, he said. Mr. Seabury explained the work of his association in seeking the standardization of ordinances throughout the country bearing on the motion picture industry and the co-operation of the league with his organization.

Three addresses were delivered at the afternoon session, one by chief engineer Morris R. Sherrerd of this city, another by supervisor of band concerts Mart King and the third by Dr. E. B. Rosa, chief physicist in the federal bureau of standards at Washington.

Mr. Sherrerd's talk was chiefly upon

this city's water supply, and he stated that there was a proposition now under consideration by the city to purchase all the privately owned water meters and thereafter to place meters at the property of every water consumer, the cost to be charged to the consumer. About forty per cent of the water used is metered, the engineer said, with about 20,000 meters privately owned and from 6,000 to 8,000 owned by the city.

One of Newark's most difficult problems, Mr. Sherrerd said, had been in financing the improvements which it had undertaken in the last quarter of a century. Part of this city's growth was attributable to its fine water supply, which had been developed in the last twenty-three years at a cost of about \$8,000,000. A conservative estimate of the value of the watershed,

he added, was \$20,000,000. Of the drainage area of sixty-three square miles, the city owns forty-six and is constantly acquiring more.

Discussing the wood block pavement on Broad street, he said the pavement had given no trouble in the matter of bulging. This was due to the fact that each block was soaked in water for at least ten minutes before being laid, so that it was laid in its expanded state. Only one other city—Norfolk—had followed this practice.

Other subjects touched on by Mr. Sherrerd were the building of the Passaic Valley trunk sewer at a cost of about \$13,000,000, having a length of twenty-five miles, and the city's reclamation of 400 acres of waste meadow land.

Dr. Rosa's paper was chiefly on the Bureau of Standards' work in suggesting regulation of public utilities. It was just as important, he said, to have specifications for service to be performed by utility companies as to have these for any other contracts. The bureau has made an extensive study of specifications for manufactured gas. There should be standards, he argued, by which to judge utility companies on such questions as efficiency, continuity and uniformity of service. In the regulation of utility companies there must be co-operation between state commissions and municipalities on the one hand and the companies themselves on the other. It was the Federal Govern-

(Continued on page 337.)

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

Trenton, Mo., has voted \$30,000 to improve the WATERWORKS and build a FILTRATION PLANT. Plans and specifications for the project have been prepared by E. E. Harper, 2404 E. 30th street, Kansas City, Mo.

Berwyn, Ill., is making a number of improvements, including PAVING and WATER distribution pipes. Alex E. Nelson, 1714 Tribune Building, Chicago, Ill., acted as consulting engineer on all the work.

In constructing three steel swing BRIDGES and a highway trestle, the Broward county commissioners, Fort Lauderdale, Fla., had plans prepared by H. C. Davis, a local engineer.

A municipal TELEPHONE SYSTEM is to be constructed soon by the Canadian town of The Pas, Man. Murphy & Underwood, Saskatoon, Sask., were retained as consulting engineers on the project.

Concrete and tile pipe SEWERS to cost about \$55,000 are to be laid by the city of Niles Center, Ill. A. L. Emerson, engineer, Chicago, Ill., prepared plans and specifications for the installation.

In constructing WATERWORKS and SEWERAGE systems, including about four miles of mains with gravity supply and three miles of sewers, the city of Copperhill, Tenn., engaged Walter G. Kirkpatrick, Birmingham, Ala.

Greenville, O., is to make extensions to its WATERWORKS system, including pipe and tanks, from plans and specifications drawn up by A. Elliott Kimberly, consulting engineer, 1031 Columbus Savings & Trust Building, Columbus, O.

Before it enters into another contract for LIGHTING with the Empire Gas & Electric Company, the city of Auburn, N. Y., is to make a thorough investigation of conditions. Mayor Mark I. Koon has engaged Horace D. Sweet, Utica, N. Y., to report on favorable terms and probably on the possibilities of a municipal lighting plant.

Conway Springs, Kansas, is improving its STREETS under the direction of J. W. Mavity, engineer, of Wellington, Kansas.

The recent collapse of part of the structure of the new FILTRATION PLANT in Cleveland, O., has been investigated by Frederick C. Noble, a New York city expert, who has reported on the rebuilding of the work.

Kingsree, S. C., is to drill new wells for additional WATER SUPPLY, for which plans and specifications were drawn up by J. Newton Johnston, engineer, Florence, S. C.

The borough of Bogota, N. J., in constructing its new SEWER system, including four miles of sewers, had the consulting engineering services of Clyde Potts, 30 Church street, New York City.

A SEWER SYSTEM and SEWAGE DISPOSAL PLANT are to be constructed by the village of Piermont, N. Y. Plans and specifications have been prepared by Alexander Potter, 50 Church street, New York, N. Y.

A reinforced concrete girder BRIDGE is to be constructed by the commissioners of Cambridge county, Ebensburg, Pa., from drawings and specifications prepared by O. P. Thomas, consulting engineer, Leader Building, Johnstown, Pa.

Ridgefield Park, N. J., is constructing a SEWAGE diversion and TREATMENT plant. Lederle & Provost, sanitary experts and hydraulic engineers, 39-41 West 38th street, New York, N. Y., prepared the plans and specifications.

Pass Christian, Miss., is taking active steps to solve its problems of BEACH PROTECTION. Major E. J. Turtle, assistant engineer in charge of the federal government works in the Pensacola district, has been retained as consulting engineer to pass on the plans for a seawall and protecting structures made by city engineer J. F. Galloway.

PERSONALS

Blue, A. F., city marshal of Comanche, Texas, has resigned and W. W. Cox, deputy, has been appointed to succeed him.

Knorr, Robert, has been appointed chief of police of Luzerne, Pa., succeeding Frank Layon, resigned.

Nissen, H. E., has been appointed chief of the fire department and building inspector for Winston-Salem, N. C.

Crotty, John, who has been chief of the Oneonta, N. Y., fire department for the past five years, has resigned.

Gallagher, Con, has resigned as chief of the fire department of Murray, Utah. E. Larson has been appointed to succeed him.

Evans, Llewellyn, an electrical contractor, has been appointed superintendent of the Tacoma, Wash., electric works, succeeding B. W. Collins, who resigned September 1.

Bridges, J. P., has resigned as mayor of Luling, Tex., and C. T. Greenwood has been appointed to the office.

Keller, S. D., has been appointed street and water commissioner of Bristol, Tenn.-Va. J. C. De Armond fills the vacancy left by Mr. Keller, who was formerly chief of police.

Hannan, Edward, Sr, formerly State Superintendent of Public Works for New York, died Sept. 6 at Troy, N. Y. He was seventy-five years old.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

SEWAGE EJECTORS.

Yeomans Duplex Centrifugal Machine for Raising Sewage.

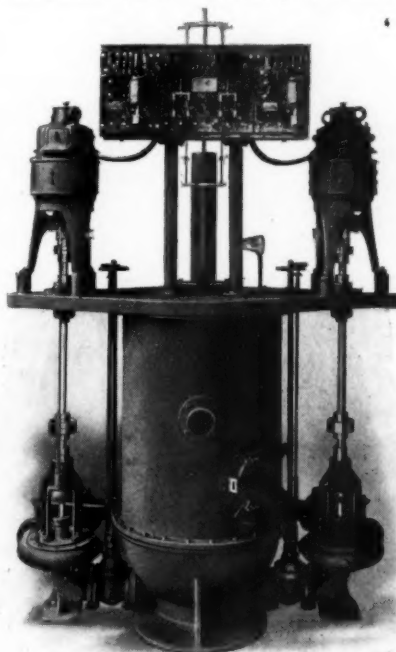
In the Yeomans form A Duplex centrifugal ejector the cast iron sewage receiver is located in the center of a dry pit built of concrete or of steel embedded in concrete. All low level sewers which will not drain by gravity into street sewer or other outlet are run to this receiver. In the dry annular space between the receiver and the ejector pit are located two centrifugal pumps with suctions connected to the bottom of the receiver and with discharge connections brought together in a double branch fitting. The pumps are direct connected to vertical shaft motors supported at the floor level by a heavy cast iron plate which forms the cover of the receiver. A float, running in an 8-inch pipe casing inside the receiver, operates automatic starters mounted on panels on top of the receiver, starting and stopping the pumps as the water rises and falls in the receiver.

The receiver consists of a cast iron cylinder with bowl shaped bottom which does not allow the accumulation of solids. All joints are machined and provided with dowel pins to give alignment. A cast iron bar screen 36 inches in diameter is provided in the receiver just below the inlets. This screen is of such mesh that it will pass paper and soil but will intercept heavy or unusual obstructions which may come through such drains. It is made in sections, easily removable, and may be cleaned without removing through the manhole in the receiver wall.

The pumps are of bottom suction, vertical, open impeller, centrifugal type, with forced feed lubricated split babitted thrust bearings and bronze covered shafts. The top plates of the pumps are so arranged that they can be raised to give access to interior of pump casing without disturbing pump shaft impeller or bearings. Rigid flanged couplings are furnished just above the pumps and from this point shaft extensions run up through the motor base to flexible type couplings immediately below the motors. The entire weight of shafts and impellers exclusive of the motor shafts is supported by self-aligning ball thrust bearings located on receiver cover. Suction connections from bottom of receiver to each pump is made with flanged straightway gate valve with extension stem to floor level and long-turn base elbow with clean-out hand hole in the side. The discharge of each pump is supplied with a bronze fitted horizontal swing check valve with extended hinge pin and lever on the outside so that

check valve can be opened for flushing back through the pump and the operation of the check valve can be observed at all times. Gate valves are provided on each unit between the check valve and riser to street sewer.

The motors are of the vertical shaft, semi-enclosed, slow speed type with ball thrust bearings in upper heads. Direct current motors have commutating poles and are capable of 15 per cent increase in speed by means of field resistance (field rheostats) so that the



YEOMANS DUPLEX SEWAGE EJECTOR.

capacity of the ejector may be temporarily increased about 50 per cent above normal. Control equipment includes self-started automatic float switches, main line switches and fuses for each motor and double throw transfer switch. Float switches are operated by direct rod from reinforced copper float, in casing suspended in center of receiver from the cover. Controllers are adjusted so that one pump will take care of the ordinary flow of sewage, and if for any reason this machine should fail to operate or keep up with the inflow, the other pump will cut in automatically. Each ejector is supplied with a float operated alarm which rings a bell if the water level in the receiver rises above the point at which the pumps are set to start. The alarm float is independent of the controller float.

Two-inch suction connections with foot valve and gate valve with extension stem to floor level are provided on each pump so that any water which gets into the ejector pit may be

pumped out. While the installation is usually made in a circular pit of steel shell embedded in concrete, a concrete pit without steel shell may be used, and the pit may be round, elliptical or rectangular to suit conditions.

The ejector is made in four sizes with total capacities (of both units) of 200-250, 300-400, 500-700 and 800-1,000 gallons per minute. The maximum head above bottom of pit is 30 feet in each case. The accompanying illustration shows the form A ejector. The apparatus is made by Yeomans Brothers Company, 231 Institute Place, Chicago, Ill.

REINFORCED CONCRETE CASE PUMP.

For Large Capacity Installations.

In recent years large engineering projects have called for pumps of constantly increasing size which have necessitated some entirely new features in design to solve their problems. For large capacity pumping work, such as drainage, irrigation and the water supply for big populations, a pump has been designed which makes a very interesting departure from the usual practice.

The case of the D'Olier-De Huff patented pump is constructed of reinforced concrete. This material renders practicable the use of pumps of larger capacity, permitting the construction of pumps having a discharge connection ten feet or more in diameter. The pump is provided with stationary rings with which the pump impeller forms a close clearance and these rings serve as anchorage for the reinforcing bars and as means of centering the concrete.

The velocities used in this type of pump are the same or lower than those used in cast iron pumps. It is claimed, however, that the concrete construction allows the use of better proportions for hydraulic design than are usually practicable where standard foundry patterns are used or where the cost of exactly correct proportions with a cast iron case would be somewhat expensive.

The interior form of the pump case is made to conform to the best requirements of hydraulic construction and is at the same time suited to ease of construction of form work. The outside shape of the case is, of course, immaterial and need only comply with the structural conditions of the installation. The case itself is built integral with the supporting foundation. The use of a waterproofing material insures against seepage through the concrete.

The accompanying diagram shows two views of a reinforced concrete case pump designed for driving by a vertical

shaft motor. The design is equally well adapted for horizontal pumps of large capacities. The pump is either furnished built complete in place or else the necessary machined iron parts and reinforcing bars are furnished with complete drawings for the concrete work. The pump is made by the D'Olier Centrifugal Pump and Machine Company, Morris Building, Philadelphia, Pa.

ipal lettings of large size have appeared and private buying is moderate. Prices hold well. Quotations: 6 inch, class B and heavier, \$30.50, class A, \$31.50.

Lead.—Lead has stiffened after buying by consumers short of stock supplies. Quotations: New York, 6.75 cents; St. Louis, 6.60.

The Creosoted Materials Company, Inc., 301 Queen & Crescent Building,

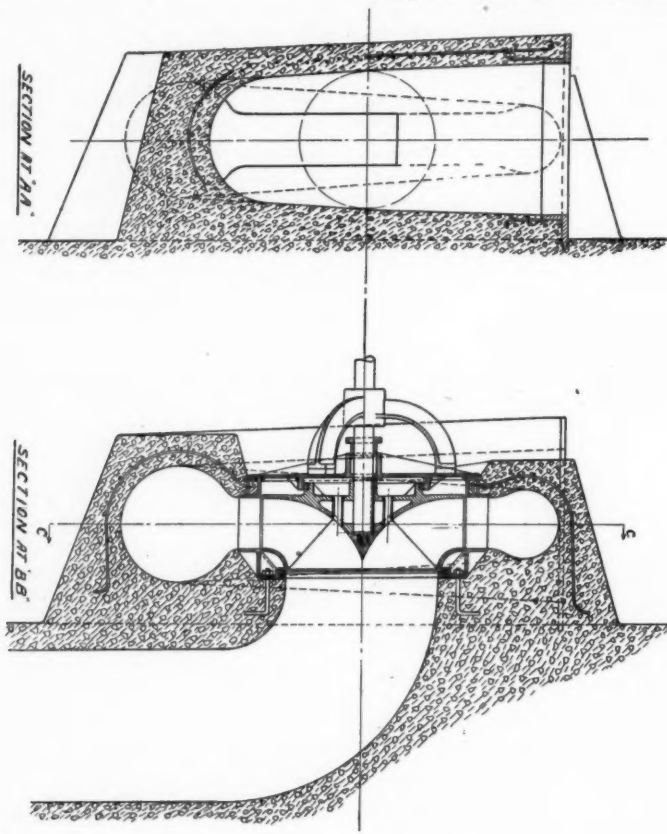
adian Chicago Bridge & Iron Company, Bridgeburg, Ontario, which makes a specialty of this class of construction. This company also recently constructed in Toronto for the City Dairy Company a similar structure having a tank in the shape of a milk bottle.

NEWS OF THE SOCIETIES

(Continued from page 334.)

ment's object to help the state bodies and municipalities.

Mr. King talked both of public band concerts and of sane Fourth of July celebrations as held in Newark. For several years prior to 1902, he said, the money for public band concerts was collected by a newspaper, but the next year mayor Doremus urged an appropriation by the city. Three thousand dollars was given and in that year twenty-five concerts were held. Gradually the appropriation was increased, and in 1908 the first Sunday afternoon concerts were given. Last year about eighty concerts were held, including several in the school auditoriums. With the appropriation of \$9,000 this year, probably 100 concerts will have been given by the end of the season.



D'OLIER-DE HUFF CONCRETE CASE PUMP.

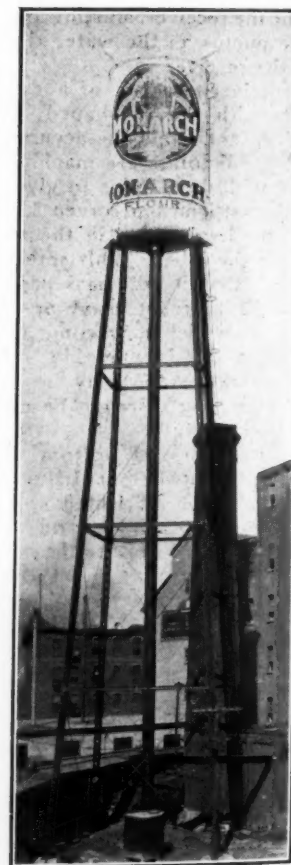
INDUSTRIAL NEWS

Cast Iron Pipe.—Chicago—The leading manufacturer is low bidder for contracts for 750 tons of high pressure and special pipe at Cincinnati, 1800 tons at St. Louis, and 300 tons at Hammond, Ind. Quotations: 4 inch, \$33.50 to \$34; 6 inch and larger, \$30.50 to \$31; class A, \$1 extra. Birmingham—A more hopeful feeling among the manufacturers is the result of the decision by the Interstate Commerce Commission suspending the new transcontinental tariff from Sept. 1 to Dec. 30. The rate to Pacific coast terminals would have been increased from \$11 to \$17.60 a ton, and would have been a severe blow to the market. The demand continues steady, with no unusual features. Several carloads of pipe have been shipped to the Pacific coast. Quotations: 4 inch, \$28; 6 inch and up, \$25; 16 foot lengths, \$25. New York—Most interesting feature is the increase in demands for export. The southern pipe foundries have heretofore been most favored, but indications are that some of this trade is being diverted to northern foundries. No munic-

New Orleans, La., is the new name of the Creosoted Wood Block Paving Company. All classes of creosoted materials are handled. R. S. Manley is president of the company and D. E. Roach is secretary-treasurer.

An Unusual Water Tank.

The accompanying photograph illustrates a large elevated water storage tank built for the Campbell Flour Mills Co., Limited, of Toronto, Ontario. The flouring mills were recently equipped with an automatic sprinkler system and the tank is used for the storage of water necessary. The prominent position and great height of the structure renders it peculiarly effective for advertising purposes, and the company has taken advantage of this fact in having the tank built in replica of a bag of flour. The work is built entirely of steel. The tank holds forty thousand gallons of water. The total height of the structure is 152 feet above foundations. The tank itself is 31 feet deep and 18 feet wide, being built oval in cross-section. The weight supported is over two hundred tons. The work was designed and executed by the Can-



The expenditure for concerts, Mr. King pointed out, on the basis of the 400,000 who heard them last season, was less than two and one-half cents per capita, or a quarter-point.

Mayor John MacVicar of Des Moines, who had a large part in the organization of the league nineteen years

ago and who has served as its president, speaking, during the Friday afternoon session, on commission government, which was adopted in his city nine years ago, said the plan gives the opportunity, and if men fail under it, it is their own fault.

"Perhaps the best thing under commission government," said Mr. MacVicar, "is the elimination of parties. The city manager plan is ideal; its one weakness lies in the question of who is to be appointed as city manager. Under this form of government we in Des Moines have done wonders. We have improved the quality of our public works; we have spent more money and got better results, and generally we have satisfied the public."

What the bureau of municipal research has done for Dayton was told by its director, C. E. Rightor, who reminded his hearers that Dayton is the largest of cities under the city manager form.

"The Dayton bureau," Mr. Rightor said, "has secured the adoption by the council of an itemized, segregated budget and has obtained public hearings on the budget. It has got the council to agree to limit the appropriations of a year not to exceed the income of that year, thereby wiping out an annual deficit. It secured proper pavements after the flood, got a larger garbage service by redistricting the routes and made the men on the wagons work whole days, instead of part time."

"The bureau also has forced the erection of a municipal garbage destructor, and whereas we used to pay \$35,000 for hauling of garbage and as much again for its disposal, we now get a profit on its destruction."

Mayor Preston of Baltimore spoke for partisan government. "I don't believe there has been a successful administration from Washington's to the present," said he, "unless it has had a party back of it. Nobody ought to be appointed to office unless he is in sympathy with the administration. I am a party man and I believe in party politics and in party administration."

Municipal sanitation was discussed by Ezra B. Whitman, under whose direction the sewers of Baltimore were built. "The city which does not take care of its sewage, garbage and water supply," said he, "is like a man who wears a dirty collar or who refuses to take a bath."

Dr. Edward M. Hartwell, secretary of the statistical department of Boston, said that city had got along very well without a bureau of research. There is no consensus of opinion, he said, on what is the best form of municipal government.

At the last session held Saturday morning, so few delegates were present that no papers were read. Dr. Delos F. Wilcox of New York, W. D. Rockwood, mayor of Cambridge, Mass.; Sam L. Rogers, Director of the Census, and Robert H. Whitten of New York were to have presented papers. Instead these were handed to the secretary for publication.

Washington State Association of County Commissioners and Washington State Association of County Engineers.

The tenth annual convention of the Washington State Association of County Commissioners, and the twelfth annual convention of the Washington State Association of County Engineers will be held at the Commercial Club, Tacoma, September 14, 15 and 16. Some of the sessions will be held jointly.

Much of the discussion of both bodies will have to do with road building and maintenance and the various materials used in the construction of hard surfaced highways. These problems are the greatest now confronting the members of the two associations, as each succeeding year finds interest in good roads rapidly increasing.

The sessions will open at 2 p. m., September 14, with a joint meeting. The address of welcome will be given by Governor Lister.

Rufus C. Holman of Portland, president of the Oregon State Association of County Judges and Commissioners, will address the commissioners on "Greater Efficiency and Economy in County Government." This will be followed by discussion led by J. T. S. Lyle of Tacoma and W. Scott Coe of Klickitat county. Professor A. H. Fuller, dean of the college of engineering, University of Washington, will discuss "Highway Bridges." The commissioners will also appoint their committees during the afternoon and in the evening will join with the engineers for a theater party.

Friday morning, September 15, a joint assembly will be held. Dr. H. K. Benson, professor of industrial chemistry, University of Washington, will speak on "Experimental Research as Applied to Road Materials." Councilman R. H. Thompson of Seattle, consulting engineer, will speak on "County Pavements."

The visitors will spend the afternoon at the Western Washington fair at Puyallup.

Friday evening James Allen state highway commissioner, will speak before the commissioners on the location and construction of state roads, also the relation of the highway commissioner's office to the county commissioner's in the matter of permanent highway law. The discussion will be led by Commissioner H. A. Reynolds of Walla Walla county. Clarence B. Osborne, chief geologist of the California highway commission, will speak on "California State Highway Work." The evening session will close with a discussion by John H. Lewis, chief engineer, state highway of Oregon, on "Highways of the State of Oregon—Laws, Construction and Maintenance."

Saturday morning the commissioners will hear an address on "Maintenance of Earth and Gravelled Roads," by Professor William F. Allison, professor of municipal and highway engineering, University of Washington. Oscar Rohn of Butte, Mont., will speak on "Experience and Views on Earth and

Gravelled Road Construction." The morning session will close with the legislative committee's report.

During the afternoon Professor J. E. Gould, consulting landscape architect for the extension division, University of Washington, will speak on "Landscape Improvement of Highways." The remainder of the afternoon will be taken up by the reports of committees, the election of officers for the ensuing year and the selection of the next annual meeting place. In the evening the commissioners and engineers will attend a banquet at the Elks' temple.

At the opening session of the engineers Thursday afternoon, David H. White, Pierce county engineer, will discuss the "Pierce County Pavements." This will be followed by a discussion by Engineer J. D. Neville of Lewis county. Edwin C. Ewing, deputy prosecuting attorney of King county, will speak on "The Condemnation of Rights-of-Way for County Highway Purposes."

Friday evening Engineer H. A. Sewell of Pend Oreille county, will speak on "Cheaper Roads." Charles D. Calley, King County bridge engineer, will discuss the Snoqualmie river bridge, and Thomas R. Beeman, division engineer of King County, will speak on "The Economic Location of Highways."

Saturday morning George Milton Savage, president of the Washington Paving Company, will discuss "The Contractor's Viewpoint." Capt. Arthur P. S. Hyde, U. S. A., will speak on "The Value of an Adequate Highway System as a Military Adjunct."

BOOK REVIEW

(Continued from page 332.)

giving opinions of the author and quoting those of others as to the merits of various methods of treatment. He expresses his belief that the plans and structural details of American cities do not suffer so much by comparison with those of European cities as most writers on city planning would have us believe; and most of his illustrations are taken from the cities of this country—a relief to readers of city planning books who have come to recognize as old acquaintances certain views of French boulevards, German street plans and English "garden cities," which appear in each new book on this subject.

The city engineer who has city planning problems presented to him (and what ones do not?) will find himself much better prepared to attack them intelligently and wisely after reading this book. He will not find exact instructions by which to determine widths, grade or other details—these must be decided by local conditions and requirements; but after a careful reading he will be conversant with the fundamental principles of the best American practice and theory relative to the "engineering aspects of city planning."

ADVANCE CONTRACT NEWS

ADVANCE INFORMATION BIDS ASKED FOR

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.

CONTRACTS AWARDED ITEMIZED PRICES

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
STREETS AND ROADS.				
Wis.	Elkhorn	3 p.m., Sept. 16.	45,000 sq. yds. pavement, sewers, etc.	A. G. Groesbeck, Chmn. Street Committee.
Ind.	Columbus	10 a.m., Sept. 16.	Constructing three concrete roads.	W. H. Scott, Co. Aud.
O.	Cleveland	10 a.m., Sept. 16.	Wood and block floors for bridge.	W. A. Stinchcomb, Co. Surv.
Kan.	Olathe	noon, Sept. 16.	Grading and paving county road.	W. J. Moore, County Clerk.
Tenn.	Morristown	Sept. 16.	Tarvia on macadam, gutters and grading.	City Engineer.
O.	Gibsonburg	noon, Sept. 16.	Improving streets	M. Mason, Village Clerk.
O.	Ravenna	noon, Sept. 16.	1 mile macadam paving and grading.	J. W. Walter, Engineer, Court House.
O.	Springfield	noon, Sept. 16.	Paving 4 streets.	C. E. Ashburner, City Mgr.
Ill.	Chicago	Sept. 16.	Paving several streets	E. J. Glackin, Secy. Bd. Local Improvements.
Wis.	Racine	10 a.m., Sept. 16.	1,000 sq. yds. brick pavement.	Board of Public Works.
Ky.	Barbourville	Sept. 16.	Grading 3 miles and macadamizing 2 miles.	F. McClure, Chief Engineer, Highway Department.
W. Va.	Welch	Sept. 16.	Constructing 40.8 miles county roads.	W. J. McClaren, County Engr.
Ind.	Indianapolis	10 a.m., Sept. 16.	Constructing sidewalks	B. J. T. Jeup, City Engineer.
Mo.	Chillicothe	noon, Sept. 16.	Grading, curbing and paving.	John Williams, City Auditor.
N. Y.	Albany	3 p.m., Sept. 18.	Laying concrete sidewalk.	Board of Contract & Supply.
Pa.	Pittston	8 p.m., Sept. 18.	Brick paving on concrete, grading and curbing.	W. F. McHugh, City Clerk.
Mo.	Webb City	5 p.m., Sept. 18.	Grading, paving, graveling and laying sidewalks and curbs	L. E. Briggs, City Engineer.
Tex.	Houston	noon, Sept. 18.	Grading and paving with 8 inches of gravel.	E. E. Sands, City Engineer.
Conn.	Waterbury	3 p.m., Sept. 18.	Grading school grounds.	W. E. Griggs, Architect, Lally Bldg.
Ind.	Fort Wayne	Sept. 18.	Wood block floors on two bridges; painting bridge.	Will Johnson, County Aud.
Minn.	St. Paul	10.30 a.m., Sept. 18.	Paving and improving streets; furnishing paving materials	H. W. Austin, Puch. Agent.
Tex.	Mt. Pleasant	Sept. 18.	8,500 sq. yds. paving and sewers.	H. S. Wilder, Engineer.
Pa.	Pottsville	10 a.m., Sept. 18.	Paving bridge with concrete and brick.	County Commissioners.
Cal.	Los Angeles	2 p.m., Sept. 18.	Constructing concrete pavement with bituminous top.	H. J. Leland, County Clk.
N. J.	Linden	8 p.m., Sept. 18.	265 lineal feet concrete walk.	J. L. Bauer, Township Engr., Elizabeth, N. J.
Mich.	Coldwater	Noon, Sept. 18.	1.5 miles concrete and 1.5 miles macadam road.	O. B. Moore, County Clk.
Ill.	Cicero	Sept. 18.	Paving alleys	A. J. Spicka, Engr.
Ind.	Indianapolis	10 a.m., Sept. 18.	Paving, grading and curbing	B. J. T. Jeup, City Engr.
Pa.	Madison	Sept. 18.	Brick paving and curbing.	W. H. Highberger, Boro. Pres.
La.	Red Oak	Sept. 18.	21,000 cu. yds. earthwork.	C. B. Forsbeck, County Engr.
W. Va.	Charleston	Sept. 18.	19,800 sq. yds. paving.	O. B. Abitt, City Clerk.
Wash.	Colfax	1 p.m., Sept. 18.	Grading, bridging and graveling 10 miles.	A. R. Metz, County Aud.
Fla.	Tallahassee	11 a.m., Sept. 18.	34 miles sand clay and 5 miles gravel or stone road.	O. C. Van Brunt, County Clerk.
Ind.	South Bend	11 a.m., Sept. 18.	Paving bridge; 5-ton motor truck; one oil road sprinkler.	A. F. Wolf, County Auditor.
N. Y.	Albany	1 p.m., Sept. 18.	Constructing and repairing state highways.	Edwin Duffey, State Hy. Com.
O.	Shaker Heights	noon, Sept. 19.	Brick, concrete, asphalt or bituminous macadam pavem't.	B. W. Willard, Engr., Engineers' Bldg., Cleveland, O.
Wash.	Pasco	Sept. 19.	Constructing permanent highways	J. W. Hamilton, Co. Engr.
Ala.	Rockford	Sept. 19.	23 miles road construction	W. P. Moon, Co. Engr., Goodwater
La.	New Orleans	Sept. 19.	26,350 sq. yds. hard surface pavement.	W. J. Hardee, City Engr.
D. C.	Washington	Sept. 19.	Sheet asphalt and asphalt block paving	District Commissioners.
Md.	Baltimore	noon, Sept. 19.	4.22 miles gravel surfacing; building concrete shoulders; 5.25 miles concrete or macadam road.	State Roads Commission.
Conn.	Meriden	8 p.m., Sept. 19.	Reinforced concrete pavement.	City Engineer.
N. J.	Montclair	Sept. 19.	Paving and curbing Stonebridge road.	Harry Trippett, Town Clk.
Ill.	Berwyn	8 p.m., Sept. 19.	Paving several streets	City Clerk.
Ind.	Gary	Sept. 19.	Paving alleys	A. S. Hess, Clerk Bd. Pub. Wks.
D. C.	Washington	11 a.m., Sept. 19.	Resurfacing roadway at Florence, S. C.	G. F. Downey, Depot Quartermaster.
N. J.	Ridgewood	Sept. 19.	Grading, macadamizing and concrete curbs, gutters and walks	Board of Commissioners.
Ky.	Covington	10 a.m., Sept. 19.	Hauling, furnishing and spreading stone.	E. O. Mills, Road Engineer.
Del.	Wilmington	noon, Sept. 19.	3.11 miles macadam road.	James Wilson, County Engr.
Mich.	Detroit	10 a.m., Sept. 19.	Granite, sandstone or Medina paving blocks for 17,000 sq. yds.	G. H. Fenkell, Comr. of P. W.
La.	Des Moines	Sept. 20.	First-class pavement on several streets.	K. O. Kastberg, City Engr.
O.	Tiffin	Sept. 20.	5,000 sq. yds. brick pavement or asphalt block.	William Heller, Dir. Pub. Serv.
N. Y.	New Brighton	Noon, Sept. 20.	8,700 sq. yds. brick pavement, curbs, etc.	Engineer, Bureau of Engineering.
Ind.	Indianapolis	10 a.m., Sept. 20.	Curbing, grading and graveling; paving.	B. J. T. Jeup, City Engr.
Ala.	Scottsboro	Sept. 20.	Limestone macadam road, cost \$4,000.	County Commissioners.
Ariz.	Phoenix	Sept. 20.	12,200 sq. yds. pavement.	J. B. Girard, City Engineer.
Tenn.	Lawrenceburg	2 p.m., Sept. 20.	Grading and surfacing 36 miles; cost, \$130,000.	County Highway Commission.
S. C.	Florence	Sept. 20.	21,000 sq. yds. pavement on macadam base.	C. H. Carlisle, City Engr.
Mass.	Fort Warren	Sept. 21.	Constructing bituminous macadam road.	Quartermaster
Cal.	Santa Barbara	Sept. 21.	Paving 2 miles of road (oil and screenings).	A. E. Cook, City Engineer.
Pa.	Pittsburgh	10 a.m., Sept. 21.	Improving Banksville road	Road Commissioners, Court House.
Va.	Roanoke	noon, Sept. 21.	Grading and macadamizing three streets.	F. L. Gibboney, City Engr.
Ill.	Sidell	2 p.m., Sept. 21.	One mile 16-ft. concrete pavement.	W. F. Dillon, County Hwy.
Ky.	Paducah	10 a.m., Sept. 21.	27,500 sq. yds. asphalt, bitulithic, monolithic, brick or concrete	L. A. Washington, Commissioner of Public Works.
O.	Columbus	noon, Sept. 21.	Draining and macadamizing.	John Scott, Clerk, Co. Comrs.
N. J.	Newark	3.30 p.m., Sept. 21.	Paving with asphalt block, sheet asphalt, granite block and wood block.	M. R. Sherrerd, Chief Engr.
N. Y.	Brooklyn	11 a.m., Sept. 21.	4,970 sq. yds. granite pavement, curbs, culverts and 20,000 sq. ft. cement sidewalks.	Bureau of Highways, 59 Court Street, Brooklyn, N. Y.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
O.	Cincinnati	Noon, Sept. 21.	Grading, curbing and paving.....	C. F. Hornberger, Dir. Pub. Service.
N. Y.	New Brighton	noon, Sept. 21.	12,600 sq. yds. concrete pavement, drainage, etc.....	Engineer, Bureau of Eng'g.
Mo.	St. Louis	Sept. 22.	Street paving; cost, \$11,000.....	Board of Public Service.
Ind.	Broad Ripple	2 p.m., Sept. 22.	Constructing road and bridge at school grounds.....	Chas. P. Wright, Twn. Trste.
O.	Cincinnati	noon, Sept. 22.	Widening Madeira Road.....	Albert Reinhardt, Clerk, Co. Comrs.
Minn.	St. Paul	noon, Sept. 22.	Automobile and motor cycle number plates for 1918, 1919 and 1920.....	J. A. Schmahl, Secy. of State
Ind.	Danville	10:30 a.m., Sept. 23.	2 1/2 miles road construction.....	C. M. Havens, Co. Aud.
W. Va.	Charleston	Sept. 23.	8 miles road work; \$150,000 available.....	P. J. Walsh, Engr. & Supt.
O.	Bowling Green	noon, Sept. 23.	Grading, curbing and constructing streets.....	J. E. Baird, Service Director.
Ind.	Columbus	10 a.m., Sept. 23.	Constructing roads.....	W. H. Scott, County Auditor.
Ala.	Double Springs	Sept. 23.	Road construction.....	J. S. Curtis, Probate Judge.
Ind.	Indianapolis	10 a.m., Sept. 23.	Paving Roanoke street.....	B. J. T. Jeup, City Engr.
O.	Bowling Green	noon, Sept. 23.	Curbing and reconstructing 2,000 ft. of street.....	J. E. Baird, Service Director.
Cal.	Los Angeles	2 p.m., Sept. 23.	Improving streets.....	H. J. Leland, County Clk.
Ind.	Gary	Sept. 23.	4,100 sq. yds. of pavement, 4,820 ft. curbs, grading and sewers; cost, \$11,300.....	W. P. Cottingham, Assistant City Engineer.
O.	Bexley	Sept. 25.	Brick and bituminous pavement between car tracks.....	John Scott, County Clerk, Columbus, O.
Tex.	San Antonio	4 p.m., Sept. 25.	Buying city asphalt plant.....	Fred Fries, City Clerk.
Wash.	Seattle	Sept. 25.	Grading and graveling road, cost \$20,000.....	A. P. Denton, Co. Engineer
Ind.	Lebanon	Sept. 25.	7 blocks brick pavement, curb, etc.....	Walter Whitecotton, Engr.
O.	Columbus	2 p.m., Sept. 25.	Brick and bituminous roadway between car tracks.....	John Scott, Clerk, Co. Comrs.
N. D.	Stanley	2 p.m., Sept. 25.	Filling and grading.....	H. P. Duggan, County Auditor.
Minn.	Roseau	7:30 p.m., Sept. 25.	Grading, turnpiking and installing culverts.....	R. J. Knutson, Village Clerk.
O.	Dillonvale	Sept. 26.	Paving two streets.....	M. Campfield, Council Clerk.
La.	New Orleans	Sept. 26.	33,000 sq. yds. hard surface pavement.....	W. J. Hardee, City Engr.
N. J.	Belmar	8 p.m., Sept. 26.	15,150 sq. yds. concrete pavement.....	Clyde Potts, Engineer, 30 Church St., N. Y. City.
O.	Ottawa	1 p.m., Sept. 26.	Furnishing stone (3,000 cu. yds.) rolling and flushing, and 11,500 sq. yds. glutrin treatment.....	J. S. Cartwright, Engr.
Ill.	Freeport	Sept. 26.	Macadam paving on three streets.....	C. S. Hepner, Engr.
Ind.	South Bend	10 a.m., Sept. 26.	Grading, paving, graveling and curbing.....	Board of Public Works.
O.	Salem	Sept. 26.	Paving three streets with brick.....	Service Director.
Ind.	Logansport	10 a.m., Sept. 27.	Furnishing gravel and crushed stone.....	A. P. Flynn, Co. Aud.
La.	Lake Charles	8 p.m., Sept. 28.	Gravel tarvia pavement; concrete sidewalks.....	E. L. Gorham, Comr. of Streets & Parks.
Ind.	Rochester	2 p.m., Sept. 29.	Constructing gravel road.....	E. A. Smith, County Auditor.
O.	Columbus	noon, Sept. 29.	2,600 sq. yds. macadam, grading, etc.....	John Scott, Clk. Co. Comrs.
La.	New Orleans	Sept. 29.	61,250 sq. yds. hard surface pavement.....	W. J. Hardee, City Engr.
Miss.	Carthage	Oct. 1.	20 miles sand clay road, cost \$25,000.....	J. A. Walker, Commissioner
Fla.	Jacksonville	4:30 p.m., Oct. 2.	2,000 sq. yds. brick and 3,850 sq. yds. asphaltic concrete pavement.....	L. D. Smoot, Comr. of P. Wks.
Ind.	Jeffersonville	10 a.m., Oct. 2.	Constructing limestone road.....	G. W. Stoner, Co. Aud.
Ind.	Fowler	1 p.m., Oct. 2.	Constructing two roads.....	Warren Mankey, Co. Aud.
Ind.	Versailles	1 p.m., Oct. 2.	Constructing stone road.....	J. L. Lochard, Co. Aud.
Ind.	Brookville	1 p.m., Oct. 2.	Constructing 15,400 ft. of road.....	C. G. Reifel, Co. Aud.
Ind.	Monticello	10 a.m., Oct. 3.	Constructing stone road.....	A. G. Fisher, Co. Aud.
Ind.	Logansport	Oct. 3.	Constructing stone road.....	A. P. Flynn, Co. Aud.
Minn.	Luverne	2 p.m., Oct. 3.	20 miles of graveling on county roads 2, 4 and 5.....	Olaf Skyberg, Co. Aud.
Ind.	Rensselaer	2 p.m., Oct. 3.	Constructing 2 stone roads.....	J. P. Hammond, Co. Aud.
Ind.	Winamac	Oct. 3.	Constructing gravel road.....	W. E. Munchenberg Co. Aud.
Ind.	Elkhart	2 p.m., Oct. 3.	Constructing road.....	A. R. Bemenderfer, Co. Aud.
Cal.	Bakersfield	Oct. 3.	10 miles stone road.....	Board of Co. Supervisors
Ind.	Frankfort	2 p.m., Oct. 4.	1 mile of gravel road.....	Edward Spray, Co. Aud.
O.	Newark	Oct. 5.	Paving two streets with brick.....	C. H. Wells, City Engr.
Ind.	Hartford City	Oct. 5.	Improving streets; cost, \$4,000.....	City Clerk.
Que.	LaSalle	5 p.m., Oct. 13.	Constructing macadam and concrete roads.....	Belque and Charton, Engrs., Transportation Bldg., Montreal.
Ind.	Brazil	10:30 a.m., Oct. 25.	Constructing county line stone and gravel road.....	W. O. Graeser, Co. Aud.
SEWERAGE.				
Minn.	Redwood Falls	1 p.m., Sept. 16.	Tile drainage ditches, cost \$103,000.....	L. P. Larson, County Auditor.
Neb.	Benson	8 p.m., Sept. 16.	Constructing sewers.....	C. Hollestelle, City Clerk.
O.	Cleveland	10 a.m., Sept. 16.	Constructing sewers in several streets.....	Co. Engr., New Court House.
O.	West Chester	Sept. 16.	Septic tank and filter beds at school.....	A. Kloman, Clerk, Bd. Education.
Wis.	Elkhorn	Sept. 16.	6,000 ft. 8 to 24-in. storm sewers, 31 catch-basins, and 25 manholes.....	A. G. Groesbeck, Chmn. Street Committee.
Minn.	Duluth	11 a.m., Sept. 16.	Constructing sanitary sewers.....	J. A. Farrell, Comr. of Pub. Works.
La.	Sioux City	10 a.m., Sept. 16.	Constructing storm water sewer.....	Chas. Kloster, City Clerk
Minn.	St. Paul	10:30 a.m., Sept. 18.	Constructing sewers.....	H. W. Austin, Purch. Agent.
Tex.	Mt. Pleasant	Sept. 18.	2,000 ft. of sewer and paving work.....	H. S. Wilder, Engineer.
La.	Creston	8 p.m., Sept. 18.	1,650 ft. 6 to 8-in. sewer, etc.....	T. S. DeLay, City Engr.
Ill.	Cicero	8 p.m., Sept. 18.	Constructing house drains.....	Charles Stoffel, Town Clerk.
N. J.	Pitman	Sept. 18.	Sewerage system and disposal plant.....	Remington & Vosbury, Engrs., Market St., Camden, N. J.
Wis.	Clintonville	6 p.m., Sept. 18.	Constructing sewer.....	City Clerk.
O.	Cleveland Heights	noon, Sept. 18.	Storm water and sanitary sewers.....	F. A. Pease Engineering Co., Marshall Bldg., Cleveland, O.
Pa.	S. Bethlehem	8 p.m., Sept. 18.	Constructing sewers and disposal plant.....	Boro Engineer
Fla.	Tallahassee	11 a.m., Sept. 18.	2,500 ft. 12 to 35-in. drains for road work.....	O. C. Van Brunt, County Clk.
Mont.	Three Forks	5 p.m., Sept. 18.	25,000 ft. 9 to 20-in. vitrified sewer, collection well, etc.....	Swearingen & McCulloh, Engineers, Tod Bldg., Great Falls, Mont.
D. C.	Washington	Sept. 18.	Furnishing drain tile and sanitary fittings.....	General Purchasing Officer, Panama Canal.
N. J.	Camden	Sept. 18.	Constructing brick sewers.....	L. P. Farnum, City Engr.
Mo.	Webb City	5 p.m., Sept. 18.	Constructing sanitary sewers.....	L. E. Briggs, City Engineer.
Minn.	Madison	1 p.m., Sept. 19.	20,600 ft. 6 to 14-in. tile drains, cost \$5,400.....	A. G. Shogren, Co. Aud.
Ala.	Tuscaloosa	Sept. 19.	Storm sewers; cost, \$8,500.....	W. H. Nichol, City Engineer.
S. C.	Columbia	10 a.m., Sept. 19.	Laying 23 miles vitrified sewer.....	T. K. Legare, City Engineer.
O.	Cleveland	noon, Sept. 19.	Storm water and sanitary sewers at Shaker Heights.....	B. W. Willard, Village Engr., Engineers' Bldg., Cleveland.
Ill.	Niles Center	Sept. 19.	Concrete and tile sewers; cost, \$55,000.....	City Clerk.
Ill.	Chicago	Sept. 19.	Sewers in several streets.....	E. J. Glackin, Secy. Bd. Local Imprvs.
N. Y.	New York	2 p.m., Sept. 19.	Drainage and water supply system in Fulton market.....	Comr. of Pub. Works.
N. J.	Montclair	Sept. 19.	Sanitary sewers in Stonebridge road.....	E. S. Closson, Town Engr.
Ill.	Berwyn	8 p.m., Sept. 19.	Constructing house drains.....	City Clerk.
Ind.	Marion	8 p.m., Sept. 21.	2,140 ft. 30-in. vit. pipe storm sewers.....	H. R. Green, Engr., Union Bldg., Cedar Rapids, Ia.
Neb.	Red Cloud	Sept. 21.	10,600 ft. 10 to 15-in. sewers and 21 manholes.....	Grant & Fulton, Engrs., Bankers Life Bldg., Lincoln, Neb.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Va.,	Roanoke	noon, Sept. 21.	Constructing sewer	G. H. Tucker, City Clerk
N. J.,	Atlantic City	3 p.m., Sept. 21.	2,560 ft. 10 to 30-in. terra cotta, brick and concrete storm sewers	John W. Hackney, City Engr.
Ia.,	Griswold	Sept. 21.	Sewer system, \$25,000 available	City Clerk
O.,	Cleveland	noon, Sept. 21.	Constructing sewer in Parkview avenue	Comr. of Engineering
Ind.,	Indianapolis	Sept. 22.	Widening Fall Creek, etc.; cost, \$100,000	B. J. T. Jeup, City Engineer
Minn.,	St. James	Sept. 22.	175,000 ft. tile drains	J. C. Jensen, Co. Auditor
O.,	Bowling Green	noon, Sept. 23.	Constructing sanitary sewer	J. E. Baird, Service Director
Ill.,	Oak Park	Sept. 25.	Three miles 9 to 20-in. vitrified sewers	W. F. Sargent, Engr.
Ill.,	Cairo	Sept. 25.	Repairing sewers	Geo. Dewey, Engineer
Ind.,	Gary	Sept. 25.	1,560 ft. 6-in. connections and paving	W. P. Cottingham, Assistant City Engineer
Ill.,	Harvel	Sept. 25.	10,000 feet of tile drain	H. J. Warnings, Drain Comr.
Ohio,	Ottawa	1 p.m., Sept. 26.	1,950 ft. 4-in. tile	J. S. Cartwright, Engr.
N. Y.,	New York	Noon, Sept. 26.	Tunnel relief sewer	Comr. of Public Works, Bureau of Sewers, New York
S. D.,	Madison	8 p.m., Sept. 28.	Sewer and water connections	William Rae, City Aud.
Ia.,	Nevada	Sept. 28.	Constructing drains, cost \$36,500	F. E. King, County Auditor
O.,	Cleveland	noon, Sept. 28.	Constructing sewers	Comr. of Engineering
O.,	Grover	noon, Sept. 29.	Constructing sanitary sewer	Seth Williams, Clerk, Board Education
Minn.,	Owatonna	2 p.m., Sept. 30.	16,000 ft. 12 to 24-in. tile drains	G. A. Ralph, Engr, 16 Fulton Block, St. Paul, Minn.
O.,	Cuyahoga Falls	Oct. 1.	8 to 24-in. tile sewers	City Clerk
O.,	Port Clinton	Oct. 3.	Sewer construction, cost \$9,800	K. E. Wedikind, City Engr.
O.,	Port Clinton	Oct. 10.	Constructing sewers; cost, \$16,000	K. E. Wedikind, City Engr.
Cal.,	Hermosa Beach	Oct. 16.	Disposal plant, cost \$27,000	C. R. Sumner, City Engr.
WATER SUPPLY.				
Ill.,	Kewanee	Sept. 16.	Constructing water reservoir and chimney	City Clerk
Neb.,	University Place	Sept. 16.	Installing water mains	C. C. Gates, City Clerk
Me.,	Waterville	Sept. 16.	Distributing reservoir, requiring 20,000 cu. yds. excavation and construction of earth dam 780 ft. long	Metcalf & Eddy, Engineers, 14 Beacon St., Boston, Mass.
Cal.,	Fort Mason	Sept. 18.	Water improvement at Presidio	Constructing Quartermaster
Kan.,	Larned	Sept. 18.	3,000 ft. 4-in. c. i. pipe, hydrants and valves	L. D. Burgess, City Clk.
Ill.,	Berwyn	8 p.m., Sept. 19.	Constructing water service pipe	City Clerk
D. C.,	Washington	Sept. 18.	Pipe fittings, gaskets, etc.	General Purchasing Officer, Panama Canal
S. C.,	Columbia	10 a.m., Sept. 19.	Laying 6 miles c. i. pipe	T. K. Legare, City Engineer
O.,	Shaker Heights	noon, Sept. 19.	Laying water mains	B. W. Willard, Village Engr., Engineers' Bldg., Cleveland
Minn.,	Granite Falls	2 p.m., Sept. 19.	Water purification plant at sanitarium	Sund & Dunham, Architects, Essex Bldg., Minneapolis, Minn.
N. Y.,	New York	2 p.m., Sept. 20.	Furnishing chlorine gas and chloride of lime	William Williams, Comr., W.S., G. & E., Municipal Bldg., New York
Mont.,	St. Ignatius	Sept. 20.	Irrigation work, including 3,400 ft. concrete pipe	U. S. Reclamation Service, Deputy Comr. of Water
O.,	Cleveland	noon, Sept. 20.	Water mains in several streets	B. D. Baxter, Village Pres.
Ill.,	Viola	Sept. 21.	20,000 ft. 4 to 8-in. mains	Chief Engr., Dept. of Public Service
O.,	Cincinnati	Noon, Sept. 21.	Laying 6-in. water main	Wm. Goldsmith, Const. Engr., New Hampton, N. Y.
N. Y.,	New York	11 a.m., Sept. 21.	Driving wells at New Hampton farms	L. M. Johnston, Engineer, Florence, S. C.
S. C.,	Kingstree	Sept. 22.	Drilling 4 or 6-in. well (100 gals. per min.)	Service Director
O.,	Salem	Sept. 22.	500 water meters, 1/2-in. to 6-in.	R. E. Thompson, Secy., Carmichael Irrigation District
Cal.,	Sacramento	10 a.m., Sept. 25.	Reinforced concrete pumping station	City Engineer
N. Y.,	Watervliet	2.30 p.m., Sept. 25.	Completing work on water works system	C. H. Foss, Secy. Water Commissioners
Ariz.,	Douglas	7 p.m., Sept. 25.	Oil engine and 750 gal. triplex pump	G. A. Borden, Pres. Bd. of Pur.
O.,	Columbus	Noon, Sept. 25.	40-ton c. i. pipe, 10-ton specials, 200 hydrants	William Rae, County Aud.
S. D.,	Madison	8 p.m., Sept. 28.	Water and sewer connections	A. E. Uhl, General Manager
Idaho,	Albion	Oct. 1.	Constructing work; cost, \$8,000	Commissioner of Public Wks., Water Department
Fla.,	Jacksonville	4 p.m., Oct. 4.	Constructing 12,000,000-gal. pumping engine	A. R. Watkins, City Auditor
N. D.,	Fargo	10 a.m., Oct. 4.	Mechanical stokers and fuel-saving devices at water-works pumping station	Obras Sanitarias de la Nacion
Argentina,	Buenos Aires	Oct. 13.	59,000 metric tons c. i. pipe and specials	
MISCELLANEOUS.				
Minn.,	St. Paul	10.30 a.m., Sept. 18.	1,565 bbls. Portland cement, 1,076 cu. yds. sand, 1,250 cu. yds. crushed stone or gravel, 32 tons pitch filler, 9,000 sq. yds. creosoted block, sewer pipe, etc.	H. W. Austin, Purch. Agent, Panama Canal
D. C.,	Washington	Sept. 18.	Supplies for Panama Canal	General Purchasing Officer, Panama Canal
Ia.,	Sioux City	2 p.m., Sept. 18.	Constructing drainage ditch, 735,000 cu. yds.	E. E. Hosmer, County Auditor
D. C.,	Washington	Sept. 20.	Refrigerating plant for Coast Survey steamer	Supt. Coast & Geodetic Survey
D. C.,	Washington	3 p.m., Sept. 20.	Installing refuse destructor at Freedmen's Hospital	Secretary of the Interior
La.,	New Orleans	Sept. 20.	Furnishing and delivering 52,000 tons rock	U. S. Engineer's Office
Ind.,	Terre Haute	noon, Sept. 20.	Constructing drainage ditches	Prairie Creek Levee Association, 401 Star Bldg.
Ind.,	Logansport	2 p.m., Sept. 21.	Cleaning and repairing ditch	E. A. Cotner, Trustee, Noble Township
D. C.,	Washington	10.30 a.m., Sept. 21.	Furnishing sheet steel, hand pumps, etc.	General Pur. Officer, Panama Canal
D. C.,	Washington	10.30 a.m., Sept. 21.	Garbage incinerator plant, hand pumps, etc.	Gen. Pur. Officer, Pan. Canal
O.,	Cleveland	noon, Sept. 22.	Furnishing underground lead cable	Director of Public Safety
Ind.,	Indianapolis	10 a.m., Sept. 27.	Removing walls and levees and improving Fall creek	B. J. T. Jeup, City Engr.
N. Y.,	Albany	Noon, Oct. 3.	Canal Sections and terminal at Rochester	W. W. Wotherspoon, State Supt. P. W.

STREETS AND ROADS

Anniston, Ala.—County commissioners are considering the purchase of auto trucks for the road department.

Jacksonville, Fla.—Advertisements have been authorized for bids for 4,000 cu. yds. of shell for the Kings road from the four-mile post north towards the Nassau county line, also for removing and hauling shell from the county's shell island in Sisters creek.

Van Buren, Ark.—Estimates for District No. 3 show that about 35,000 sq. yds. of paving will be laid. Bids will be received within the next two or three weeks for the work.

Los Angeles, Cal.—Mariposa Ave. is to be improved.

Martinez, Cal.—Contra Costa County will pave all roads.

Pomona, Cal.—An election will be held in November to vote on bond issue for good roads.

Sacramento, Cal.—A special election

will be held Oct. 3 for purpose of voting on road bonds amounting to \$1,700,000. 124.42 miles of road are to be built as follows: Marysville rd., 6.11 miles; H St. road, 12.38 miles; Fair Oaks-Greenback Lane, 2.47 miles; Greenback lane road, 7.20 miles; Plymouth Rd., 14.75 miles; Florin-Upper Stockton Rd., 1.75 mile; Florin-Perkins Rd., 3.66 miles; Elk Grove-Franklin Rd., 3.33 miles; Elk Grove-Sheldon Rd., 4.56 miles; Lower Stockton Rd., 8.62 miles; Galt-New Hope Rd., 7.40 miles; Clay Rd., 9.25 miles;

Sacramento-Freeport Rd., 5.43 miles; River Rd., 34.10 miles; Pocket Rd., 3.38 miles.

Stockton, Cal.—Plans are afoot for a meridian highway between the San Francisco Bay region and Nevada.

Danbury, Conn.—Plans are being made by the selectmen to repair roads.

New Castle, Del.—Street Improvement Commission will have Wilmington Ave. resurfaced, and with money available will make improvements to 4th St. This street is in direct line with Wilmington Ave. and Delaware St.

Daytona, Fla.—Bonds amounting to \$145,000 will be issued for hard surfacing main streets with warrenite, concrete or brick; \$15,000 bond issue will be used to improve street drainage by constructing laterals under all streets to be improved.

Jacksonville, Fla.—Special election will soon be called to vote on issuance of highway bonds amounting to \$60,000, for Baker County.

Jacksonville, Fla.—Co. Clerk Brown has been ordered to prepare advertisements asking for bids for 2 miles of sand clay road connecting the Kings Rd. to Dinsmore.

Ormond, Fla.—Bonds for the Ormond boulevard will soon be issued.

Atlanta, Ga.—The paving of South Pryor St. from Georgia Ave. to Garnett St. will probably be postponed until next year.

Macon, Ga.—Ordinance providing for resurfacing of certain streets in business section of city will be submitted to City Council at its next session. It is proposed to take up brick and lay concrete and cover with tarvia. Address Mayor Bridges Smith.

Rome, Ga.—The Huntsville, Alabama, Chamber of Commerce is intensely interested in the opening of the highway between Rome and Huntsville, and will lend their energies in co-operation with the Rome Chamber of Commerce to this exceedingly important enterprise until it has been completed.

Mattoon, Ill.—A 14-ft. monolithic brick pavement is to be constructed on Marshall Ave. from 32nd St. to the West City limits.

Albion, Ind.—Sept. 15, 1916, at 10 a. m., by Treasurer of Noble county, for sale \$2,700 and \$14,200 highway improvement bonds, 4½ per cent., ten years. Roy K. Riddle, Treasurer.

Angola, Ind.—No bids were submitted for the Pleasant township road, Steuben county, advertised for letting on September 5.

Auburn, Ind.—Steuben and Dekalb county commissioners failed to receive any bids for construction of a county line road advertised for letting on September 5.

Bluffton, Ind.—Sept. 20, 1916, at 2 p. m., by Treasurer of Wells county, for sale \$7,680 highway improvement bonds, 4½ per cent., ten years. James A. McBride, Treasurer.

Brazil, Ind.—The council have been forced to postpone the letting of the contract for the paving of Kruzan St. from Walnut to Forest Ave., for the lack of a bid.

Clinton, Ind.—Construction of road will be readvertised.

Columbia City, Ind.—Two township line roads in Whitley county have not been let.

Delhi, Ind.—Sept. 13, 1916, at 2 p. m., by Treasurer Carroll county, for sale \$12,900, \$4,900 and \$4,800 highway improvement bonds, 4½ per cent., ten years. W. H. Lesh, Treasurer.

Fort Wayne, Ind.—The board of works have adopted resolutions for grading Hancock Ave. from Maumee Ave. to McDonald St., for cement sidewalks on the west side of Jackson St. from Lavina St. to the south line of lot No. 3 in Chipman's addition, on the south side of Walnut St. from Fairfield Ave. to Oakley St., on the east side of South Wayne from Organ Ave. south, on both sides of Beaver from Federal to Rudisill Blvd., on the north side of Greenlawn Ave. from Koch St. to Hensch St., on both side of Leith St. from Calhoun St. to Hoagland Ave., on the south side of Grace Ave. from Fox St. to Broadway, on both sides of Grant St. from Washington St. to Maumee Ave., on the west side of Lantz St. from Tennessee Ave. to Delaware Ave., and for the paving of the alley south of Creighton Ave. from Fox St. to Miner St.

Goshen, Ind.—Elkhart County Trust Co. have purchased county road bonds amounting to \$8,500. J. F. Wild & Co., Indianapolis, an issue amounting to \$66,500.

In This Issue: Contract News

Roads and Streets.

94 new bids asked
160 proposed work items

Sewerage:

31 new bids asked
40 proposed work items

Water Supply:

22 new bids asked
52 proposed work items

452 advance news items, including "Miscellaneous"—all new and reliable, for the municipal works contractor. More municipal contract news than any other paper.

Municipal Journal Leads in Service to Contractors

Harrison, Ind.—No bids have been received by the Knox county commissioners for the construction of 15,840 ft. of gravel road.

Hartford City, Ind.—J. P. Cronin has purchased Blackford county highway bonds amounting to \$8,000.

Indianapolis, Ind.—Sept. 11, 1916, at 10 a. m., by Treasurer of Marion county, for sale \$10,800 highway improvement bonds, 4½ per cent., ten years. Ed. O. Sourbier, Treasurer.

Indianapolis, Ind.—Delaware County National Bank, Muncie, Ind., has purchased highway bonds amounting to \$38,800.

First National Bank of Martinsville has purchased Morgan County highway bonds amounting to \$5,900.

Indianapolis, Ind.—Ordinance has been passed authorizing City Controller to negotiate a temporary loan of \$40,000 for city Board of Health; also providing for following appropriations: \$2,000 to sewer construction and repair, salaries and wage fund; \$2,000 to street maintenance and repair, unimproved, salaries and wage fund; \$1,500 to street repair, asphalt, accounts, and \$832.21 for street maintenance and repair unimproved accounts.

Indianapolis, Ind.—J. F. Wild & Co. have purchased Dubois county road improvement bonds amounting to \$9,000.

Jeffersonville, Ind.—A new road 2½ miles long has been authorized in Jeffersonville township and viewers have been named for a free gravel road two miles long in Washington township.

Jeffersonville, Ind.—Sept. 14, 1916, at 10 a. m., by Treasurer of Clark county, for sale \$9,000 highway improvement bonds, 4½ per cent., ten years. John R. Scott, Treasurer.

Kentland, Ind.—J. F. Wild & Co., Indianapolis, have purchased Newton county bonds amounting to \$9,240.

Kendallville, Ind.—Voters of Noble township have decided not to construct a five-mile stretch of gravel road.

La Porte, Ind.—Sept. 20, 1916, at 10 a. m., by Treasurer of La Porte county, for sale \$19,600, \$8,800, \$2,400, \$2,400 and \$3,700 highway improvement bonds, 4½ per cent., ten years. Carl Pusch, Treasurer.

Kokomo, Ind.—The commissioners have ordered the Marcellus Smith road in Clay township to be established.

Logansport, Ind.—The John Carson road in Clay township is to be constructed at an estimated cost of \$28,000.

Logansport, Ind.—Ordinances have been passed providing several special appropriations for expenses in various departments for current year, which included \$500 for Health Department, \$10,000 for Electric Light Department, \$7,000 of which was to pay for labor incident to general overhauling of electric light system this summer, and \$3,000 for improvements to plant. Sum of \$5,400 was made for maintenance, improvements and additions to filter plant and water-works plant.

Nashville, Ind.—Oct. 2, 1916, at 1 p. m., by Treasurer of Brown county, for sale

\$5,520, \$9,060 and \$3,500 bonds, 4½ per cent., ten years. Can Clark, Treasurer.

Rensselaer, Ind.—Sept. 20, 1916, at 1 p. m., by Treasurer of Jasper county, for sale \$5,600 and \$7,600 highway improvement bonds, 4½ per cent., ten years. Charles V. May, Treasurer.

Rochester, Ind.—F. E. Bryant has purchased Fulton county highway bonds amounting to \$15,500.

Shelbyville, Ind.—Sept. 23, 1916, at 10 a. m., by Treasurer of Shelby county, for sale \$25,600 highway improvement bonds, 4½ per cent., ten years. S. A. Brown, Treasurer.

South Bend, Ind.—Additional bond issue of \$7,000 has been authorized by the county commissioners for road construction.

Stiox City, Ia.—Bids for the repaving of Nebraska, Pierce and Douglas Sts. will be advertised during the winter months and the contract let early next spring. There is a possibility that the council will let the contract for the repaving of Fourth St. at the same time. When bids are readvertised for they will be taken on concrete, asphalt, brick and creosote blocks.

Waterloo, Ia.—Damaged asphalt pavement throughout the city is to be repaired.

Independence, Kan.—An ordinance has been passed providing for the grading, paving, curbing and guttering of West Locust St. from the west line of 11th St. to the west line of 12th St.

Lawrence, Kan.—The improvements covered by the ordinances passed are: Paving Louisiana St. from 16th to 18th St.; paving Locust St. from Second to Eighth St. North; paving alley west of Louisiana St. from Eighth to Ninth St.; paving 16th St. from Louisiana St. to a point 300 ft. west; sanitary sewer in district No. 3, University Pl.; sanitary sewer west of New Hampshire St. from 14th to 15th St.

Pittsburg, Kan.—Petitions have been filed at Girard for the Commercial Highway, a proposed rock road across Crawford County from north to south, a distance of 25 miles.

Jeffersonville, Ky.—Bids will be received by County Treasurer John R. Scott until Sept. 14 for road bonds amounting to \$9,000.

Monroe, La.—A special election will be held soon to vote on issuance of bonds amounting to \$40,000, to construct a gravel road from Ouachita parish line to the traffic bridge at Columbia along east side of Ouachita River.

Patchogue, L. I.—Sum of \$8,000 has been appropriated to pave S. Ocean Ave. with concrete.

Augusta, Me.—It has been ordered that the committee on streets be authorized to contract with the Hassam Paving Co., of Worcester, Mass., to construct Main St. from Appleton St. to College Ave. and College Ave. to the street crossing opposite the north side of Union St.

Waterville, Me.—See "Miscellaneous."

Haverhill, Mass.—County Commissioners have voted \$1,000 additional for the widening of a part of Kingsbury Ave.

Becket, Mass.—Only one bid has been received for building new road between Main St. railroad crossing and the Becket-Washington town line, which was found too high and was rejected. Officials will advertise for new bids.

Springfield, Mass.—Upon recommendation of Board of Public Works, following improvements were voted: Widening Knox St. on east side, new curbs on Colton St., new sewer on Manitoba and White Sts., an extension to the east for 60 ft. on sewer at Center St., Indian Orchard, and new sidewalks for Fort Pleasant Ave., Smith St., Harrison Ave., Webster, Clinton, Franklin, Alderman, Butler, Knox and Arch Sts.; sidewalks for Armory St. were refused upon recommendation of Board of Public Works.

Upton, Mass.—The road between Upton and Milford is to be repaired.

Petoskey, Mich.—More concrete pavement is to be constructed.

Saginaw, Mich.—Surveyors are laying out the improved new road between Midland and Saginaw.

Duluth, Minn.—Estimated cost to extend Roosevelt St. from 58th to 61st Ave. West is \$15,150.06.

Duluth, Minn.—City commissioners are going to authorize the improvement of St. Marie St. from Vermillion road to Woodland Ave., as a boulevard.

Minneapolis, Minn.—Cost for paving approximately 15 miles of arterial streets according to estimate of Senator J. T. Elwell is \$500,000.

Coffeetown, Miss.—A bond issue amounting to \$100,000 for the purpose of improving roads in Yalobusha county has been voted.

Columbus, Miss.—At a joint meeting of Board of Revenue and Public Highway Commissioners of Lamar County, Alabama, held at Vernon, Ala., it was decided to advertise at once for bids for construction of 15 miles, which will complete route of proposed Jackson Highway through Lamar County.

Magnolia, Miss.—Hibernia Bank & Trust Co., New Orleans, has purchased road bonds amounting to \$130,000.

Meridian, Miss.—Ordinance has been passed providing for construction of concrete curbs and gutters on several streets and avenues.

Waynesboro, Miss.—Bond issue for \$25,000 to \$50,000 for road purposes is contemplated.

Chillicothe, Mo.—A maintenance bond of \$5,000 is to be issued for Calhoun St.

Freehold, N. J.—It has been decided to build a gravel road from Cox's corner to New Canton, about three miles in length.

Glen Ridge, N. J.—Sealed proposals will be received by Borough Clerk until 8 o'clock p. m., Sept. 25, for paving bonds amounting to \$5,500. John A. Brown, Borough Clerk.

Newton, N. J.—It has been recommended to Town Committee that \$12,000 be spent for concrete street from Spring St. at the Madison line to County Court House, and \$8,000 be appropriated for electric street lighting.

Passaic, N. J.—Ordinance has been introduced providing for widening Van Houten Ave. between Mineral Spring Ave. and city limits in a westerly direction and on westerly side of the street.

City Clerk has been directed to advertise for proposals for laying sheet asphalt pavement on Bergen St. between 1st St. and a point 100 ft. east of 4th St.

Passaic, N. J.—Van Houten Ave. is to be widened between Mineral Spring Ave. and the city limit, and the grade is to be changed between Richards St. and the city limit.

Brooklyn, N. Y.—The Corporation Counsel has approved the form of contract and bids will soon be advertised for the following improvements: Regulating, grading, curbing and laying sidewalks on DeKalb Ave. from the Brooklyn Boro. line to Onderdonk Ave., and for the paving with granite block in DeKalb Ave. from Onderdonk to Seneca, Ridgewood; regulating and paving with granite block in Cypress Ave. from Cody to Cooper Sts., Ridgewood; regulating and paving with sheet asphalt in Sedgwick St. from Hughes St. to Catalpa Ave., Ridgewood; regulating, paving with sheet asphalt in Fairview Ave. from Woodbine to Madison Sts., Ridgewood; regulating, grading, crosswalks and gutters, with a temporary pavement 20 ft. wide, of bitulithic macadam, centrally located on Toledo St., from Corona Ave. to Justice St., and for sidewalks on the east side from Morton St. to Justice St.

Herkimer, N. Y.—A resolution by Supervisor Johnson has been adopted, directing the clerk to request the State Highway Commission to readvertise for bids on the Van Hornesville-Starkville road. Plans must be revised because all bids were higher than the engineer's estimate, due to the high cost of labor and materials.

Niagara Falls, N. Y.—City manager has been ordered to advertise for bids for the elimination of the College Ave. grade crossing.

Syracuse, N. Y.—Ordinances have been adopted designating asphalt as the material for resurfacing pavements in the following streets: West Onondaga, South West St. to Slocum Ave.; North West, Park Ave. to N. Y. C. R. R. tracks; Euclid, College Pl. to Lancaster Ave.; West Water St. to South Clinton St. to South Franklin St.; Walton, South Clinton to South Franklin Sts.; College Pl., University Pl. to Euclid Ave.; Slocum, Shonard St. to West Onondaga St.; Fitch, West Onondaga St. to South Geddes St.

Wilmington, N. C.—The building of an improved road from Caroline Beach to Fort Fisher Sea Beach, a distance of about 3 miles, is under consideration.

Winston-Salem, N. C.—Wilkes County will soon vote on bond issue of \$250,000 for good roads.

Bowling Green, O.—It has been declared necessary to improve Ridge St.

from Main St. to Thurston Ave. by paving with macadam, concrete or other asphalt mixture.

Marietta, O.—Chamber of Commerce has asked the county to pave county road on the west bank of the river as far as Injun Run.

Middletown, Ohio.—Bigler Bros. have given an estimate on paving Edgewood Ave. as \$1,043.60.

Niles, O.—Ordinance has been passed authorizing officials to issue bonds amounting to \$18,000 for improvement of S. Main St. from Meander Creek to city limits by grading and paving same.

Salem, O.—A resolution has been passed by council appropriating from the \$15,000 bond issue the city's share of the following improvements: E. 7th St. paving, \$2,369.36; W. Green St. sewer, \$18; W. Dry St. paving, \$48; W. Dry St. sewer, \$14; Jennings Ave. paving, \$6,370.81; Green St. paving, \$1,229.20; Franklin Ave. paving, \$1,363; E. School St. paving, \$474.06; paving of alley south of High St., \$705.92. The total amount is \$12,593.35.

Urbana, O.—Paving bonds amounting to \$30,500 are to be issued.

Albany, Ore.—Linn county are planning a system of hard surfaced roads of about 200 miles. Petitions are being circulated.

Marshfield, Ore.—The Clark-Kendall Co., Portland, have purchased road bonds amounting to \$362,000.

Allentown, Pa.—A stone gateway will be erected at the entrance to the city on Liberty St., immediately west of 25th St.

Beaver, Pa.—The secretary of the board has been instructed to readvertise for bids for the laying of concrete sidewalks on various streets.

Bradford, Pa.—Evans & Haher, Bradford, were only bidders on 3,516 sq. yds. brick pavement on concrete and their bid of \$13,789.35, being above engineer's estimate will be rejected. Bids will probably be readvertised early next spring. B. A. Wise, city engineer.

Bryn Mawr, Pa.—Radnor township wants new roads.

Erle, Pa.—Improvement of Meadville road is under consideration.

Ferris, Pa.—Ordinances for the paving of Henry St., from Summit Ave. to Glenwood Ave., and Glenwood Ave. from Henry St. to Station St. have been passed. The bids for this paving will be opened and a contract awarded in October.

Pittsburgh, Pa.—Money has been provided for improving thoroughfares.

Wilkes-Barre, Pa.—An ordinance has been passed authorizing and directing the grading, curbing and paving of Howard St. and East Broadway St.

Wilkes-Barre, Pa.—Ordinances have been passed authorizing the grading, curbing and paving of Meade St. between Market and Coal Sts.; Willow St. between Carey Ave. and Plymouth Aves.; Simpson St. between Carey Ave. and Plymouth Ave.; Oak St. between Carey Ave. and Plymouth Ave.; and Franklin St. between Kulp Ave. and Elm St., all with sheet asphalt pavement.

Williamsport, Pa.—Curtin St. is to be narrowed from 30 to 28 ft.

Windber, Pa.—Plans are being made for a new road in northern end of Sister county.

Barrington, R. I.—Glen Ave. at Nayatt is to be repaired and improved at \$1,500.

Bristol, R. I.—Plans are being made for the repair of many streets.

Central Falls, R. I.—The sum of \$2,500 has been appropriated to improve Adams St.

Pawtucket, R. I.—Appropriation of \$8,292.50 has been made for the purchase of land for the purpose of widening Dexter St., between Main St. and Railroad Ave.

Providence, R. I.—A petition has been received requesting the grading and curbing Laurel Ave.

Woonsocket, R. I.—City Engineer Mills has been instructed to procure an estimate of cost of grading Laval, Victor, Richelleu and Lafayette Sts.

Nashville, Tenn.—Union St. is to be widened 8 ft.

Denton, Tex.—Bond issue of \$800,000 for good roads is being considered.

El Paso, Tex.—The estimated cost of paving Chihuahua St., from improve-

ment district No. 1 to Second St., to the property owners, \$7,884.08 and curb at 30 cts. a ft., the cost to the city to be \$156.60. Oct. 12 is the date set for a property owners' hearing.

Salt Lake City, Utah.—Utah county citizens held a meeting to promote highway plans. A bond issue of \$500,000 is contemplated.

Burlington, Vt.—Main St. will be improved soon.

Richmond, Va.—Half million dollars has been asked for Broad St. viaduct, and an equal amount for streets.

Richmond, Va.—Superintendent H. J. Cohn of the street cleaning department has reported to the administrative board the need of a road-repairing machine which, he says, may be purchased for \$225. The report was referred to the city engineer with instruction to draw a proper requisition for the machine if it meets with his approval.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Ontario, Cal.—*The S. C. Contracting Co., Los Angeles, for paving 271,000 sq. ft., at \$80,297.

San Francisco, Cal.—*Pacific Creosote Co. for paving Battery St. from California St. to the Embarcadero with wooden blocks. It is estimated that about 100,000 wooden blocks will be required to complete the paving and the contract price is 40 per 1,000 blocks laid.

Wilmington, Del.—*W. G. I. Co., Philadelphia, for resurfacing road from Mount Pleasant to Maryland line.

Palata, Fla.—Bids opened Sept. 4 for 11 miles brick roads as follows: Glesson & Hancock, \$23,500; Logan Concrete & Engineering Co., \$29,644.24.

Chicago Heights, Ill.—*Chicago Heights Coal Co., for local improvements, including the grading, paving and curbing of portions of Main St. and Birmingham Ave., at \$12,878.94.

Pekin, Ill.—Contract awarded to *Janson & Zoeller, Pekin, for brick pavement at \$1.70½ per sq. yd., 54 cts. for curbing, 30 cts. for protection curb and 10 cts. for resetting curb. Other bidders were: D. A. Meyer of Peoria, and the Beardstown Construction Co.

Bedford, Ind.—*L. C. Faubion, for construction of Heltonville road at \$16,324; *N. R. Clark, Bedford and Tunnelton road, at \$6,005; *McPike Bros., Rawlins Mill Bridge road, \$2,988.

Clinton, Ind.—*Guy H. Briggs, local, for building Miller road at \$6,848.

English, Ind.—*John W. Hubbard, local, for road work at \$2,640.

Fort Wayne, Ind.—*To *Grace Construction Co., for paving alleys with concrete.

Frankfort, Ind.—County gravel road contracts awarded as follows: *C. F. Gum, local, two roads; *Wm. Nees, local, one road; *A. F. Cohn, one road.

Goodland, Ind.—*A. E. Gray, local, for road construction on Hickory Grove township at \$12,900.

Greenfield, Ind.—Bids received by the county commissioners for road work as follows: *Thomas New & Son, \$7,995; T. B. Leary, \$8,394; George Hoppes, \$9,370. On Marshall-Wales road bids were received as follows: *G. W. Crider, \$12,950; George Hoppes, \$13,170.

Hartford City, Ind.—*Carl C. Curtis, for Maddox road, at \$10,377. Other bidders were: C. F. Kegerreis, \$11,913.38; Albert Hart, \$11,909.68, and John Burkley, \$10,397.

Huntingdon, Ind.—Following contracts have been awarded: To *Joseph Hall, Logansport, for road work, \$11,662; to *Samuel Palmer, local, for road work, at \$14,936.

Indianapolis, Ind.—Board of public works has awarded contract for bituminous concrete paving to *Marion Construction Co.

Indianapolis, Ind.—A few bids for paving streets with "first grade" asphalt have been received as follows: Gale St. from 10th to 16th Sts., Union Asphalt Construction Co., bituminous concrete, \$2.40 a lin. ft.; the American Construction Co., bituminous concrete, \$2.45 a lin. ft. Olney St. from Pratt to 10th Sts., Union Asphalt Construction Co., bituminous concrete, \$3.68 a lin. ft. Kenwood Ave. from Maple rd. to 40th St.,

Union Asphalt Construction Co., "first grade asphalt, \$3.20 a lin. ft., and bituminous concrete, \$2.90 a lin. ft.; American Construction Co., asphalt, \$3.05 a lin. ft. and bituminous concrete, \$2.73 a lin. ft., and the Republic Construction Co., asphalt, \$3.21 a lin. ft., and bituminous concrete, \$3 a lin. ft.

Indianapolis, Ind.—Charles E. Reddington of Greensburg for construction of 15,320 ft. of roadway in Posey township for \$15,615.

Jeffersonville, Ind.—William Pass, Sellersburg for road construction at \$8,700. Logan Dellinger and Bert Lutz for road construction at \$5,500.

Logansport, Ind.—Walter Girtan for construction concrete street in town of Camden, Carroll county, at \$16,000.

Madison, Ind.—Following contracts have been awarded: James E. Miles, Madison, for tarvia macadam, \$16,650; Wendel P. Jacobs, Madison, for tarvia macadam, \$13,290.

Madison, Ind.—Miles & Jacobs, local, for 5½ miles macadam road at North Madison, at \$30,000.

Nashville, Ind.—J. Matt Fleetwood, Kirtz, Ind., for road construction at \$4,913.

Nashville, Ind.—Adam Swank, local, at \$2,540 for road construction.

Nashville, Ind.—G. W. Polly, Elkinsville, Ind., for road construction at \$6,550.

Paoli, Ind.—Contract let to James W. Case, French Lick, for two roads at \$3,600.

Petersburg, Ind.—Contract awarded to Jean & Snyder, local, for constructing 6¼ miles rock roads at \$27,490.

Rensselaer, Ind.—A. S. Keene, Wheatfield, Ind., at \$5,072 for stone road. Geo. Stulbaum, Tefft, Ind., at \$6,999 for road construction.

Richmond, Ind.—Schneider Bros., for cement curbs and gutters at 65 cts. per ft. for straight curb and gutter, 68 cts. for circular and 12½ cts. a ft. for crosswalks and intersections.

Rockville, Ind.—Gravel road contract awarded to W. G. Carty, Montezuma, Ind., at \$11,115.

Salem, Ind.—A. H. Chastain, local, at \$6,842.50, for 4 miles of road construction.

Scipio, Ind.—William Hulse, local, at \$7,045.75, for constructing stone road.

Shelbyville, Ind.—D. H. Fatout, Indianapolis, for concrete and other roads at \$24,929. Davis Construction Co., at \$24,998, and Kent Construction Co., at \$25,610, other bidders.

Shoals, Ind.—Bids for limestone road in Halbert township received from J. A. Jones, Shoals, Ind., and F. Mundry, Huron, Ind.

Valparaiso, Ind.—Contract awarded to Gerald McGillicuddy, local, for road construction at \$4,198.

Washington, Ind.—Bids received as follows on road work: Abe Hart, \$3,200; O. C. Barber, \$3,421; Ira Cox, \$3,465.

Winchester, Ind.—County commissioners have awarded contracts for road construction to G. Walter Hiatt at \$3,129.64, and to Henry Hilt at \$3,156.

Cedar Falls, Ia.—To G. W. Gordon, Omaha, Neb., for 5.2 miles road construction at \$25,181.05. Moore-Sleg Construction Co., Waterloo, Ia., only other bidder at \$25,233.40.

Denison, Ia.—Contract awarded to M. L. Flinn Paving Co. for constructing 22,000 sq. yds. concrete pavement and 11,000 ft. curb.

Dubuque, Ia.—J. F. Lee for paving West 3rd St. with brick, and 4th St., between Locust and Bluff Sts., with asphalt.

Sioux City, Ia.—P. C. Hauson & Son for paving South Lakeport and West Second Sts. E. L. Toal for paving 19th St.

Henderson, Ky.—For rebuilding five miles rock road, Ed. Manion, Henderson, Ky., at \$22,000. Moran Perkins of Hopkinsville was only other bidder.

Louisville, Ky.—John Howe, for Center St. improvement at \$3.93 a front foot; Goulding Bros., Oak St. improvement at \$4.15 a front foot.

Louisville, Ky.—K. A. Barker for paving with concrete Lyons Ave., from Barbee St. to Shipp Ave., at \$37,000. J. A. Cahill, for paving with vitrified blocks Bloom St., from Brook to Floyd Sts., and McHenry St., from Ash to Mulberry Sts., at \$6,700. Also an alley be-

tween Clay and Shelby and St. Catherine and Baroness Sts., and an alley between Longest and Slaughter Aves. and Willow Ave. and Basset St., with vitrified blocks, at \$5,600. G. W. Gosnell Co., for paving with vitrified blocks an alley between Burnett and Hill Sts. and First and Brook Sts., at \$1,602.

Newport, Ky.—Metzel & O'Hara, for reconstruction of 10th St. east of Park Ave., which will be wood block.

Boston, Mass.—Bids for artificial stone sidewalks as follows: Dorchester Ave., easterly side, near Richmond St., D. M. Biggs & Co., 60 Marsh St., Dorchester, \$405.70; D. De Matteo, \$406.10; J. J. Sullivan, 273 West 5th St., S. Boston, \$454; Wm. J. Rafferty, & Co., 33 Champney St., S. Boston, \$459.82. Engineer's estimate, \$442.

Lansing, Mich.—To Farrell Bros., for paving Saginaw and Sheridan Sts., at \$2,000.

Pontiac, Mich.—Brice Day, of Romes, for construction of 2½ miles of 16-ft. gravel road on the Pontiac and Orion Rd. in Orion Twp., at \$14,000.

Albert Lea, Minn.—Bids received as follows for constructing 7,162 ft. concrete curb and gutter: Albert Lea Construction Co., \$3,061.66; Republic Co., local, \$3,482.16.

Duluth, Minn.—Bids for paving 6th Ave. east from 7th to 11th Sts. have been received as follows: One-course concrete, J. Johnson, \$13,862.75; Rogers & MacLean, \$15,148.75; A. N. Nelson, \$14,508, and Magnus Peterson & Co., \$14,528.10. McGilvray nonskid, J. Johnson, \$14,611; Rogers & MacLean, \$15,405, and Magnus Peterson & Co., \$14,528.10. Sandstone—J. Johnson, \$19,649.50; Rogers & MacLean, \$21,475.85; A. N. Nelson, \$20,924.25; Magnus Peterson & Co., \$20,575.35.

Duluth, Minn.—J. Johnson, on Sixth Ave. paving at \$13,862.75 for concrete and \$19,649.50 for sandstone. Only one kind will be laid and council will decide at next meeting.

Duluth, Minn.—Rogers & MacLean low bidders on Minnesota Ave. paving at \$10,902.20.

Duluth, Minn.—A. N. Nelson, improving Morse St., \$3,403.50.

Joplin, Mo.—Williams Construction Co., Pittsburg, Kan., at \$19,775, for paving several streets.

Sedalia, Mo.—Graham Concrete Products Co., for paving several streets.

Cranford, N. J.—Only bid received for 1,500 sq. yds. of waterbound macadam was from Charles Lentz, Jr., Rahway, at \$1,541.90. Edward Mosher, Township Engineer.

Hackensack, N. J.—Bids received for 6,892 sq. yds. bituminous concrete paving on 5-in. macadam foundation, and 6,193 yds. excavation in Bergen and Hudson counties. Engineer's estimate, \$1.45 per sq. yd. for paving, 30 cts. for excavation. Bids as follows: Charles T. Kavanaugh, 94% of engineer's estimate; Northern Construction Co., 110½%; Standard Bitulithic Co., 114%; R. J. Emmer, 99½%. Engineer's estimate entire work, \$18,929. H. W. Durham, County Engineer, Bergen County.

Hillside, N. J.—P. Camillo, for the construction of concrete sidewalks on both sides of Broadway, between Long Ave. and Silver St., who asked \$1,087.60. Other bidders: Varzello Co., \$1,317.44, and J. C. O'Neill, \$1,169.28.

Mt. Holly, N. J.—Following bids received on 16,748 sq. yds. bituminous concrete on macadam, 5,167 cu. yds. loam excavation and 8,954 cu. yds. extra embankment: Charles A. Reed & Co., Trenton, N. J., pavement, \$1 per sq. yd., foundation, \$1.03; grading, 48 cts. per cu. yd.; embankment, 68 cts. per cu. yds.; total, \$42,567.24. Russell Klockner, Hopewell, N. J., \$1 and 80 cts. for pavement and foundation and 50 cts. and 65 cts. for grading and embankment; total, \$38,549.17. Newton Paving Co., Trenton, N. J., 90 cts. and 88 cts. for pavement and foundation, and 45 cts. and 55 cts. for grading and embankment; total, \$37,061.25.

Utica, N. Y.—H. W. Roberts & Co. for oiling portions of the Parkway drives, at \$1,042.50 for approximately 14,000 sq. yds. of oiling at 4½ cts. and about 250 net tons of stone screening at \$1.65.

Stacy, N. C.—For constructing 4½ miles of road, J. W. Boon, New Port, N. C., at \$3,990.

Marion, O.—C. C. Brady, for resurfacing Marion-Agosta Pike at \$1,525; engineer's estimate \$1,545.

McAlester, Okla.—John W. Rooks, lo-

cal, for paving First St., between Washington and Adams Aves., at \$3,412.75.

Eugene, Ore.—Bids received for the construction of the new road around Cape Horn on the lower Lake creek. The county court called for two separate bids, one being for 2,500 ft. and the other for 2,700, as follows: No. 1, 2,500 ft., Simon Klov Dahl, \$2,488.76; Albert C. Finseth, \$2,318.75; Ole Soleim, \$2,401.51; Lyons & Johnson, \$2,309.76; W. A. Mead, \$2,305.70. No. 2, 2,700 ft., Simon Klov Dahl, \$2,898.87; Albert C. Finseth, \$2,983.30; Ole Soleim, \$3,237.14; Lyons & Johnson, \$2,885.71.

Conemaugh, Pa.—For paving bridge approach with brick on concrete, E. H. Brua, Hollidaysburg, at \$1,373.27. Boro furnishes brick.

Pittston, Pa.—Bids received for brick paving on concrete from Davis & Parry, Dorrancetown, at \$5,168.40, and from O'Brien Bros., Avoca, at \$5,172.90. Contract will be awarded Sept. 11.

Richmond, Va.—John J. Curley, for paving and grading two streets at \$1,809.25; J. C. Weinbrunn, for two streets at \$1,214.40.

Richmond, Va.—For paving with granite spalls on Government road, K. L. Black & Co., at about \$10,000; John J. Curley for grading and paving alley at \$1,445.

Suffolk, Va.—Contract for street resurfacing with bitulithic or asphaltic concrete, let to McGuire Construction Co., Greenwood Bldg., Norfolk, Va., at \$4,800.

Seattle, Wash.—For 27,806 sq. yds. brick pavement on concrete, excavation, etc., contract awarded to Sparger Conc. Co., Coleman Bldg., Seattle, at lump bid of \$72,600. Holt & Jeffrey, Transportation Bldg., Seattle, bid \$74,500.

SEWERAGE

Birmingham, Ala.—County Sanitary Engineer L. H. Slater is now preparing estimates for the lowering of the East Lake sewer as ordered in a resolution passed by the Board of Revenue. The work, it is stated, will cost about \$22,000 and the contract will be awarded soon.

Bridgeport, Conn.—Sewers will be ordered constructed in the following streets: Dover St., from Boston Ave. to Tudor St.; Pequonnock St., from Chestnut St. to Park Ave.; Park Ave., from Pequonnock St. to Atwater St.

Daytona, Fla.—See "Streets & Roads."

Rome, Ga.—See "Water Supply."

Quincy, Ill.—Bonds amounting to \$326,457 will be issued for improvements on the Indian Grove Drainage district.

Antwerp, Ind.—An ordinance has been passed providing for the construction of a sewer on the north side.

Evansville, Ind.—A 12-in. sewer is to be constructed in High St. from sewer in Goodsell St. to a point 345 ft. toward Third Ave.

Shelbyville, Ind.—A large new storm sewer is to be constructed in Tompkins St. City engineer has been ordered to prepare plans immediately. Approximate cost will be \$10,000.

Wabash, Ind.—County commissioners have ordered the construction of two public drains.

Cedar Rapids, Ia.—The Benesh addition sewers are to be built and possibly water mains will also be installed.

Dubuque, Ia.—Council has instructed city engineer to prepare sketch and plans for a sewer at the municipal bathing beach.

Grissold, Ia.—\$25,000 in bonds have been voted for sewer system. Address Town Clerk.

Lawrence, Kan.—See "Streets and Roads."

Sag Harbor, L. I.—The Civic and Suffrage Club has instructed its secretary to write the board of health of Sag Harbor village and ask it to take some action to provide a system of sewers.

Springfield, Mass.—Plans for proposed sewerage system to be installed in Agawam have been approved by Allen J. MacLoughlin, director of Health Dept., Boston.

Detroit, Mich.—The petition of Samuel Rabinovich for permission to construct sewers in the alleys north of Michigan Ave., between Larkin and Cecil Sts., to connect with the Michigan Ave. sewer, was denied, on recommendation of the city engineer.

Duluth, Minn.—American Exchange

National Bank has purchased ditch bonds amounting to \$130,000.

Duluth, Minn.—Estimated cost of five sewers which have been ordered constructed as follows: 96th., \$1,147; 97th., \$1,167; 98th., \$1,128; and 97th, from Gary to Crestline court, \$2,030.

Duluth, Minn.—A resolution for the construction of a storm sewer in 26th Ave. West from Third St. West to Third alley has been filed in the office of City Clerk Borgen by Public Works Commissioner Farrell. Estimated cost of improvement, \$257.68.

Newark, N. J.—A sanitary sewer has been asked for Vaux Hall district.

Pittman, N. J.—Estimates show that complete sewer system will cost approximately \$110,000; contract will soon be awarded.

Springfield, N. J.—A mass meeting is to be held soon to get the general opinion of the residents on the construction of sewers.

Rome, N. Y.—Plans and specifications for sanitary sewer extensions have been presented to the council by City Engineer Plunkett by direction of the Water & Sewer Board, the estimates being as follows: Knox St., \$610.80; Scott Ave., \$63.60; alley east of George St. and north of Bloomfield St., \$127.20.

Lorain, O.—Estimate of extension of Reid Ave. storm water sewer south between 28th and 29th Sts., to eliminate open ditch, is approximately \$15,000.

Middletown, Ohio.—The approximate cost of new sewers for Third St. is \$40,000.

Eugene, Ore.—City Engineer has completed plans for a new sewer in the alley between Washington and Jefferson Sts. from 14th Ave. to the alley between 12th and 13th ayes.; also sewer in Cheshire Ave. and Jefferson St.

Exeter, Pa.—The secretary of the council has been authorized to advertise for bids on sewer system in lower end of borough.

Beaumont, Tex.—See "Water Supply." **Burlington, Vt.**—Property holders on Howard St. from Pine to Hayward St., and in Willow St. from Interval Ave. to St. Louis St. ask for sewers.

Richmond, Va.—Bids have been received and opened for the construction of several sewers in different parts of the city, and have been referred to the city engineer for tabulation and report.

Wellsburg, W. Va.—Bonds amounting to \$85,000 will soon be issued to provide for sewerage the town.

Waterford, Wis.—All bids for sewer in East Main St. have been rejected as too high and will be readvertised.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Stockton, Cal.—Bids received for construction storm sewers in certain streets of the "Schweitzer tract" and along East and Fresno Sts. as follows: W. S. Gause, \$8,970; *F. C. McIntire, \$7,884.44; Chambers & Heafey, \$9,468.46. The estimate of the city engineer, \$7,793.44.

Bridgeport, Conn.—For constructing intercepting sewer, *T. J. Pardy Construction Co., local, at \$223,088.73. Bids submitted by other concerns totaled as follows: E. DeV. Tompkins, Inc., to complete by July 1, \$501,482.90; to complete by Nov. 1, 1917, \$398,293.85. The United States Drainage & Irrigation Co. bid upon section A-B only, about one-third of the constructing, starting at the end of Bostwick Ave., \$121,510. The bid of the Mason Hillson Co., totaled \$431,563.25. The Burns Co. of this city bid for the entire work \$617,164.50. James Ferry & Sons bid upon sections B-C and C-D, \$383,972.10.

Elkhart, Ind.—To *Samuel Schaefer of Concord for constructing drainage ditch requiring 30,637 cu. yds., at \$2,985.

Evansville, Ind.—*Evansville Plumbing Co., for sewer construction at 34 cts. per ft. for 10-in. pipe, 51 cts. for 12-in., \$20 for manholes and \$25 for inlets.

Kokomo, Ind.—*John Shaffer, for constructing Houser ditch.

Logansport, Ind.—Contract awarded to *Palmer & Moore Co. for constructing sewer in Douglas St. H. H. Thompson, City Engineer.

Boston, Mass.—Bids received for pipe sewers and drains, as follows: Adams St. from Rosemont Rd. N. E., about 180 ft. southerly Southwick St., from Freeport St. to Neponset Ave.; *Antony Cefalo, 316 Belgrade Ave., W. Roxbury, \$1,557; M. H. Loonie, 73 Gibson St., Dorchester, \$1,810.05; V. Grande, 59 Hull St., C. P., \$1,844; Louis Balboni, 7 Haverly St., W.

Roxbury, \$1,911.50; Timothy Coughlin, 6 Fenno Pl., Dorchester, \$2,013.20; engineer's estimate, \$1,899. Levant St. from about 100 ft. east of Terboe St., about 150 ft. easterly, and Delano St., between Levant St. and Bowdoin St., Dorchester; *John F. Lynch, 44 Gibson St., Dorchester, \$653.85; Antony Sefalo, \$743.25; M. H. Loonie, \$772.25; Timothy Coughlin, \$848; Geo. J. Regan, \$1,041.50; engineer's estimate, \$665. Academy Hill Rd. and Wm. Jackson Ave., Brighton; *Geo. J. Regan, \$2,730.50; John McCourt Co., 46 Walt St., Roxbury, \$3,175.05; Anthony Baruffaldi, 9 Parker Pl., Somerville, \$3,812.50; engineer's estimate, \$2,844.25.

Pontiac, Mich.—Bids received for the construction of sewer in Cannon St. from Forest Ave. along railroad property to Cannon St. and in Cannon St. to Baldwin Ave., and in Prospect St. from Sanford St. to Going St. and Raeburn St. from Sanford St. 380 ft. easterly, as follows: *Sam McLain bid 98 cts. per ft. for sewer on Prospect St., manholes, \$43 each and \$5 each for lampholes; 95 cts. per ft. for sewer on Raeburn St., \$43 each for manholes and \$5 each for lampholes. Oakland Construction Co. bid 99 cts. per ft. for sewer on Raeburn St., \$42 for manholes and \$5 for lampholes; 99 cts. per ft. for sewer on Prospect St., \$42 each for manholes, \$1.23 per ft. for sewer on Cannon St., \$40 each for manholes, and \$5 each for lampholes.

Detroit, Mich.—Sewer contracts awarded are as follows: Harpen Ave. sewer, section 1, *August Wagner, \$80,385; Harper Ave., section 2, *August Wagner, \$42,729; Harper Ave., section 3, *C. H. Bennett, \$36,507.60; Joy road sewer, section 1, *W. Porath, \$66,797.20; Joy road, section 2, *W. Porath, \$34,245; Linwood Ave. sewer, *J. Porath, \$13,496.04; Nicolet Ave. sewer, *J. Porath, \$44,241.18.

Duluth, Minn.—Norquist & Berg, low bidders, at \$2,329, on sanitary sewer construction on Fifth St.

Kasson, Minn.—*J. J. Connolly, 1007 Reaney St., St. Paul, awarded contract at \$5,740 for constructing sewer.

Belleville, N. J.—Contract awarded to *Peter D. Amato, Sumner Ave., Newark, at \$2,145, for 1,080 ft. 15-in. sewer.

Ridgefield Park, N. J.—Bids received for construction of sewers, treatment works, etc., as follows: For earth excavation, Class A, \$1.45 per cu. yd.; Class B, \$1.45 per cu. yd.; for rock excavation, \$4 per cu. yd.; for embankment, \$1.25 per cu. yd.; for concrete, Class A, \$11.50 per cu. yd.; Class B, \$9 per cu. yd.; for steel reinforcement, .042c. per lb.; for lumber in place, \$70 per 1,000 ft. board measure; for sheeting left in place, \$40 per 1,000 ft. B.M.; for piles, exclusive of railroad crossing, 42c. per lin. ft.; for piles at railroad crossings, 55c. per lin. ft.; for ballast, \$2.60 per cu. yd.; for stone protection, \$2.50 per cu. yd.; for anchor piers, \$75 per pier; for concrete posts with platforms, \$25 per post, without platforms \$20 per post; for sludge pump houses, \$950 per house; for sludge pumps with engine and appurtenances, \$1,300 per pump with engine and appurtenances; for cast iron pipe, 3-in. hub and spigot, Class C, 90c. per lin. ft. of pipe; 6-in. flanged, Class B, \$1.25 per lin. ft.; 6-in. flanged, Class C, \$3.35 per lin. ft.; 8-in. flanged, Class A, \$2 per lin. ft.; 8-in. flanged, Class C, \$3.50 per lin. ft.; for 12-in. flanged, Class A, \$4 per lin. ft.; 12-in. hub and spigot, Class A, \$3 per lin. ft.; 24-in. hub and spigot, Class B, \$6 per lin. ft.; 24-in. flexible jointed, Class B, \$12 per lin. ft.; for 1-in. brass compression bibbs, \$3 per bibb; for 1 1/4-in. brass stop cocks, \$5 per cock; gate valves with valves boxes, 3-in., \$8.50 per gate valve; with valve box, for gate valve with attached operating keys, 6-in., \$20; gate valve with valve box, \$35 per gate valve with gate box; gate valves with special stems and operating stands, 8-in., \$42.50 per gate valve with special stem and operating stands; for hydrants with frost cases and connections, \$35; for 6-in. expansion joints, \$35 for expansion joints; for 6-in. circular sluice gates, \$20; for 8-in. automatic flow regulators, \$75; for 12-in. automatic flow regulators, \$100 per regulator; for stop planks, \$7 per stop plank; for weirs, \$18 per weir; for structural steel exclusive of railroad crossing, a lump sum of \$285; for vitrified pipe sewers complete, no cut, 8-in., 50c. per lin. ft. complete; 0 to 6-ft. deep, 75c. per lin. ft.; 6 to 10-ft. deep, \$1.45 per lin. ft.; 10 to 14-ft. deep, \$1.90 per lin. ft.; 14 to 18-ft. deep, \$2.70 per lin. ft.; 18 to 22-ft. deep, \$3.50 per lin. ft.; 10-in., 6 to 10-ft. deep, \$1.60 per lin. ft.; 10 to 14-ft. deep, \$2.05 per lin. ft.; 14 to 18-ft. deep, \$2.60 per lin. ft.; 18 to 22-ft. deep,

\$4 per lin. ft.; 12-in., 0 to 6-ft. deep, \$1 per lin. ft.; 6 to 10-ft. deep, \$1.70 per lin. ft.; 10 to 14-ft. deep, \$2.17 per lin. ft.; 14 to 18-ft. deep, \$2.70 per lin. ft.; 15-in., 0 to 6-ft. deep, \$1.25 per lin. ft.; 6 to 10-ft. deep, \$2 per lin. ft.; 10 to 14-ft. deep, \$2.65 per lin. ft.; 14 to 18-ft. deep, \$3.30 per lin. ft.; 18 to 22-ft. deep, \$4.15 per lin. ft.; 22 to 24-ft. deep, \$4.75 per lin. ft.; 18-in., 0 to 6-ft. deep, \$1.52 per lin. ft.; 6 to 10-ft. deep, \$2.38 per lin. ft.; 10 to 14-ft. deep, \$2.85 per lin. ft.; 24-in., complete, no cut, \$1.90 per lin. ft.; 24-in., 0 to 6-ft. deep, \$2.65 per lin. ft.; for concrete sewer and appurtenances at railroad crossing complete, except pile foundation at the lump sum of \$3,800; for vitrified pipe risers, 75c. per lin. ft.; for bituminous joint compound in place, 5c. per lb.; for manholes, \$70 per manhole; for storm water by-passes, \$275 per by-pass; for altering house drain connections, \$15 per house drain; for altering existing sewers the lump sum of \$400. *Carrington Construction Co., Passaic, N. J., \$101,278.52; C. S. Edwards, Jersey City, N. J., \$102,005.05; J. F. Shanley Co., Newark, N. J., \$102,365.55; J. E. Bunting Co., Flushing, L. I., \$106,951.50; Day & Zimmermann, Philadelphia, Pa., \$116,829.10; Hezmann & Goodman, Jersey City, N. J., \$121,114.95.

Glenburn, N. D.—*G. W. Kemper, Minot, for construction of sewer at approximately \$3,000.

Mandan, N. D.—Contract awarded to *Badger Construction Co., Fargo, at \$12,206, for constructing sewers.

Toledo, O.—Contract awarded to *J. N. Beck Co., Toledo, at \$140,000, for constructing sewers, disposal plant and water mains. Gawn Const. Co., Cleveland, and Gessner & Cothrel, Toledo, were other bidders.

Warren, O.—Contracts awarded to *Dennis & Dougherty, at \$8,500, for laying 8 and 12-in. sewers, and to *James McCracken, at \$1,250, for sewers in Dawson St.

Philadelphia, Pa.—Bids for the construction of 1,400 ft. of the Frankford Creek intersecting sewer, between Lycoming St. and Kensington Ave., received by department of public works as follows: Ryan & Reilly, \$62,411; Emilio Pascuzzi, \$68,411; Keystone State Construction Co., \$90,972.

West View, Pa.—Contract awarded to Austin & Matthews, Connellsville, for constructing sewers.

Nashville, Tenn.—*John Broderick for building a 15-in. clay pipe trunk sewer in 18th Ave., north, from the Second Ward trunk sewer southwardly, at \$439.30. *Sam Rogers & Son, for building a 12- and 10-in. clay pipe sewer in Bradeau Pl. and alley 934, at \$368.20.

Spokane, Wash.—Bids received for construction of 33rd Ave. sewer as follows: *Henry Dixon, \$3,777.50; J. W. Hastings, \$3,800; J. C. Broad, \$4,500, and Heikkila, Miller & Paulson, \$3,985. Engineer's estimate, \$4,040.

Kenosha, Wis.—Peter Fraudsen & P. E. Johnson, Kenosha, low bidders on sewer construction at \$64,316.25. Other bidders: J. D. Hanley, Portland, Ore., \$69,783.50; Thornton Bros., St. Paul, \$73,494.50; Wisconsin Tunnel & Const. Co., Milwaukee, \$77,845. Council has not yet decided whether to accept or reject bids.

Waupun, Wis.—Bids for sewer construction opened as follows: G. W. Mulholland, Kaukauna, Wis., \$23,211; Gray-Robinson Co., Manitowoc, \$23,581.

WATER SUPPLY

Coalinga, Cal.—The citizens committee has raised \$1,300 and has employed F. G. Dessery to make investigations of the possibilities of developing a gravity water system. The committee will make thorough investigation before calling for an election to provide a municipal plant.

Richmond, Cal.—An election is under consideration to vote on bond issue of \$1,742,000 to purchase a water shed in Marlin county, install a reservoir and lay a pipe line.

San Diego, Cal.—City Engineer's estimate of cost of "apron" on Morem dam is \$88,000.

Cave Spring, Ga.—\$20,000 bonds have been issued for constructing water works and sewers. Address Mayor.

Rome, Ga.—Cave Spring is to issue bonds for waterworks and sewers amounting to \$20,000.

Burley, Ida.—Improvements costing \$7,000 will soon be made on the water system.

Galesburg, Ill.—Water mains are to be installed in several streets.

Oglesby, Ill.—Several thousand dollars will be expended for improving water system. Address Town Clerk.

Jasper, Ind.—J. F. Wild & Co., Indianapolis, have purchased water works bonds amounting to \$9,000.

Cedar Rapids, Ia.—See "Sewerage."

Sioux City, Ia.—Plans for the construction of a city water system in North Riverside will be completed soon. The water department will rush the plans in order that the material may be purchased this winter. The system will be installed next spring. The railroad company proposes to construct a large reservoir near North Riverside to supply water for the new shops.

Bushwick, Md.—The sum of \$71,805 is to be spent for improvements to water works. Engineer Norton, Bird & Whitman, Baltimore, Md.

Detroit, Mich.—The village of Wyandotte will soon begin the construction of a filtration plant.

Lansing, Mich.—The purchase of new pumping equipment for the water works is under consideration.

West St. Paul, Minn.—The water board will at once let contracts for installing a \$40,000 water system. Address Secretary of Water Board.

Trenton, Mo.—E. E. Harper, engineer of this city, has prepared estimates for proposed filter plant to cost \$50,000.

Webb City, Mo.—At a special election recently citizens defeated a proposition to issue bonds amounting to \$7,000 for improvement of water system.

Page, Neb.—Ways and means to install a water system is under consideration. Address Village Clerk.

Nutley, N. J.—Town engineer is preparing plans and specifications for a new water main.

Trenton, N. J.—Bonds amounting to \$30,000 will be issued for the purpose of improving the water plant and building a filtration plant. Plans and specifications will soon be ready. E. E. Harper, 2404 East 30th St., Kansas City, Mo., consulting engineer. J. H. Fletcher, City Clerk.

Auburn, N. Y.—Citizens will vote at the regular November election on the question of whether a filtration plant shall be added to the water system.

North Hempstead, N. Y.—About \$35,000 will probably be spent for a water plant. **Saranac Lake, N. Y.**—The Cranberry Lake Commission has appropriated \$25,000 for new dam.

Grand Forks, N. D.—A special election will be held soon to vote on issuance of bonds amounting to \$25,000, to use for improvement of the filter plant.

Akron, O.—Expenditure of approximately \$167,000 in enlarging the water works purification plant in order to meet the prospective demands on the water supply next year is advocated by Service Director Beck.

Bellevue, O.—The issue of \$50,000 bonds for improving the municipal gas and water plant will be submitted to vote at November election. Address U. L. Kennedy, Mayor.

Bellevue, O.—The installation of another pump at the water works is contemplated.

Defiance, O.—Bonds amounting to \$125,000 will be issued for the purchase of Defiance Water Co. for a municipal plant.

Lorain, O.—Installation of new principal feeder lines, abandonment of booster pumping station, storage tanks for mills and factories, storage tank of 500,000 gallons capacity at water plant, at a total cost of about \$57,908, are improvements recommended for the water plant.

Sandusky, O.—It has been decided to lay 6-in. water main in Curran St. instead of a 4-in. one, as was first planned.

Enid, Okla.—The issuance of bonds amounting to \$50,000 for water extension is under discussion.

McLeod, Okla.—The Benham Engineering Co., of Oklahoma City, has prepared estimates for water system. Address City Clerk.

Nashville, Okla.—A \$25,000 water system is under consideration. Address City Clerk.

Okmulgee, Okla.—\$25,000 in bonds is necessary to improve water system. Address City Clerk.

Wemoka, Okla.—The city will vote on the question of issuing \$30,000 bonds for improving water system. Address Mayor.

Philadelphia, Pa.—The chief of the water board recommends the appropriation of \$5,000,000 for the purchase of new machinery and filter beds. Address Carlton E. Davis, chief of water bureau.

Beaumont, Tex.—See "Miscellaneous."

Beaumont, Tex.—C. W. McNear & Co.,

Chicago, Ill., have purchased water and sewer bonds amounting to \$25,000.

Norfolk, Va.—T. B. Dornin, engineer in charge of the water department, will begin work shortly on plans and specifications for water mains, laterals and connections in the streets to be improved by the city out of the proceeds of the \$217,000 bond issue.

Osceola, Wis.—A special election will soon be held to vote on issuance of bonds amounting to \$25,000 for water works system.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Wilmington, Del.—Four bids were received on two 9,000,000 and one 12,000,000 gallon centrifugal pumps. Bidders were: Alberger Pump & Condenser Co., N. Y.; Dravo-Doyle Co., Philadelphia; R. D. Wood, Philadelphia, and M. L. Bayard, Philadelphia.

Barry, Ill.—Monie and Dunbar, of St. Louis, for water system, sections 1, 4, 5, 6 and 7 complete, which consist of cast-iron pipe and special castings, building, concrete reservoir, pump motor, pipe connections and pipe laying from the spring to the city, total amount of bid \$15,184.45.

Normal, Ill.—Contract awarded to *American Well Works, Aurora, Ill., at \$22,000, for constructing water works and septic tank.

Odebolt, Ia.—Contract has been let to *Des Moines Bridge & Iron Co., Des Moines, at \$13,500, for constructing steel water tank.

Pleasantville, Ia.—*C. W. Rolland for constructing water tower and laying mains.

Washington, Ia.—*J. H. Selden, Muscatine, awarded contract for constructing 1,000,000 gallon reinforced concrete reservoir.

Boston, Mass.—Bids received for laying water pipes as follows: Theodore, Leslie and Orlando Sts., Newcastle Rd. and Menton St., Dorchester, and Upton St., Hyde Park: *M. De Sisto, \$2,067.25; James Barletta, \$2,089.05; V. Grande, \$2,287.50; Martino De Matteo, \$2,547.50; engineer's estimate, \$2,204.35. Hyde Park Ave., Blayton and Carlford Rds., also along right of way near railroad line between Blayton Rd. and Carlford Rd.; Wyvern and Hobson Sts., West Roxbury: M. De Sisto, \$1,975.80; James Barletta, \$2,181.90; *Hugh McNulty, 51 Coolidge Rd., Allston, \$2,094.10; Martino De Matteo, \$2,212.45; V. Grande, \$2,547.30; engineer's estimate, \$2,216.20. Readvertisement, laying water pipe, N. Y., N. H. & H. R. R. yard at Readville and Sprague Sts., from railroad bridge to Dedham: *M. De Sisto, 198 Legrange St., W. Roxbury, \$2,317.40; James Barletta, \$2,720; V. Grande, \$2,880; Martino De Matteo, \$5,321.25; engineer's estimate, \$2,588.

Duluth, Minn.—Simon Johnson for laying 8-in. water and 6-in. gas main on Crestland court, at \$1,338.

Mount Morris, N. Y.—*United States Cast Iron Pipe & Foundry Co., for cast iron pipe, at \$12,114.59.

Mount Morris, N. Y.—*McCarthy & Wall, local, for relaying two miles of water line at \$9,059.78.

Ogdensburg, N. Y.—*Doyle Construction Co., local, for construction concrete dam across the Grasse River at Madrid.

Fargo, N. D.—*C. H. Porritt, for constructing 9 blocks of large water main. *Haggart Construction Co. for constructing water main on 11th St.

Toledo, O.—See "Sewerage and Sanitation."

Beaumont, Tex.—*M. W. Carroll, for drilling artesian wells in Magnolia Park.

Galveston, Tex.—*J. W. Zempner for erection of three pump houses for new water wells at Alta Loma at \$1,380.

Manitowoc, Wis.—Contract awarded to *McMullen & Pitz, local, for constructing an intake including 500 ft. of 30-in. cast iron, at \$8,530.

MISCELLANEOUS.

San Diego, Cal.—A special election will be held for the purpose of authorizing the issuance of bonds amounting to \$125,000, for municipal improvements.

San Jose, Cal.—City manager is considering the purchase of a broom-filling machine.

Vallejo, Cal.—A \$150,000 reinforced concrete warehouse will take the place of the wooden structure destroyed by fire at the Sperry flour mill plant.

Washington, D. C. (Proposals for Government supplies and construction).—

Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Dept., Washington, D. C., to which bureau firms desiring to submit proposals should apply, giving schedule numbers, for the supply of the following: Terra cotta sewer pipe, galvanized steel pipe, 8 ins. in diameter by 10 ft. long, acid-proof, stoneware pipe, interchangeable counter bores, and micrometer depth gauges; schedule 109, portable radial drills; schedule 112, condenser (4 sheets) tube sheets and 6-in. wall radial drills; schedule 116, furnishing and installing motor and control equipment; schedule 122, single conductor wire; schedule 126, electric water heaters; schedule 127, 230 volts 3 horsepower motors; schedule 128, furnishing and installing indicators (oil level); schedule 130, 30-in. plain radial drill, 16-in. high-speed sensitive drill. (Refer to "Opportunity Number" 3548).

Washington, D. C. (Proposals for Government supplies and construction).—Sealed proposals will be received by the Lighthouse Inspector, Buffalo, N. Y., for rebuilding wharf, etc., at Sandusky Bay Lighthouse Depot (Center Point), Ohio. (Refer to "Opportunity Number" 3552).

Washington, D. C.—Philippine bonds soon will be offered for public sale, the War Department has announced, to pay for Manila Railroad, bought by the insular government for \$4,000,000.

Washington, D. C.—(Bureau of Foreign and Domestic Commerce, Department of Commerce.) Commercial attache of the Department of Commerce in Peru transmits the name and address of a man who has undertaken a campaign for establishment of public playgrounds. Catalogues and full information should be sent to the man and to the commercial attache. (Refer to "Opportunity No. 22360.")

Sarasota, Fla.—Bonds amounting to \$18,000 will be issued for a municipal recreation pier.

Galesburg, Ill.—New garbage collection and disposal system is to be installed.

Columbia City, Ind.—A city building is to be erected. The new building will include a public comfort station, a large municipal public hall, city council chamber, city offices and quarters for housing the fire department.

Ft. Wayne, Ind.—The city is planning to purchase a big truck equipped for hauling garbage. Address John Harkender, supt. of the garbage crematory.

Huntington, Ind.—New jail, to cost not less than \$25,000, to be constructed on present site, is under consideration.

Indianapolis, Ind.—See "Streets and Roads."

Logansport, Ind.—See "Streets and Roads."

Washington, Ind.—Sept. 12, 1916, at 2 p. m., by Auditor of Daviess County, for sale \$30,000 county bonds, 4 per cent., ten years. J. G. Clark, Auditor.

Newport, Ky.—Question of issuing bonds in sum of \$40,000 for erection of garbage incinerator will be voted on at regular fall election.

Waterville, Me.—Bonds are to be issued amounting to \$15,000 for school house and street improvements.

Purvis, Miss.—Board of Supervisors of Lamar County is to purchase 10 additional mules and borrow \$10,000.

Atlantic City, N. J.—It is estimated that cost of building proposed seawall at Longport will be in the neighborhood of \$275,000.

Roselle, N. J.—An ordinance has been passed providing for a bond issue of \$10,000 for the purchase of a park.

Syracuse, N. Y.—Aldermen may favor the issue of bonds for construction of an incinerating plant.

Greensboro, N. C.—Bonds amounting to \$75,000 are to be sold Oct. 3 for completion of Court House.

Loveland, O.—Sealed proposals will be received until 12 o'clock noon, Oct. 9, for purchase of village bonds, amounting to \$6,000. O. P. Bodly, Village Clerk pro tem.

Middletown, O.—Sealed bids will be received at the office of the city auditor until noon, Oct. 11, for the purchase of bonds amounting to \$35,000 for the improving and repair of parks.

Montgomery, O.—Sealed proposals will be received until noon, Sept. 15, for bonds amounting to \$392.50.

Salem, O.—Sealed proposals will be received until noon, Sept. 24, for the purchase of bonds amounting to \$15,000. George Holmes, city auditor.

Toledo, O.—Willis-Overland Co. is willing to spend \$250,000 on improve-

ment of Willys Park, formerly Central Grove.

Toledo, O.—Issuance of bonds amounting to \$850,000 will be voted upon at regular election on Nov. 7.

Philadelphia, Pa.—Bonds amounting to \$10,000,000, the first installment of new city loan, will be sold at City Treasurer's office about Nov. 1.

Beaumont, Tex.—Bonds amounting to \$330,000 will be issued for construction of more municipal wharves and for extending water mains throughout city.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

New Orleans, La.—Following bids on levee work were opened by Board of State Engineers, Sept. 5: Gaine's Landing levee, Chicot county, Ark., Mississippi River, right bank, approximate contents 20,000 cu. yds. George R. Lacy bid 41 cts. a cu. yd. The engineers recommended that the bid be rejected. In Pontchartrain district, in the parish of East

Baton Rouge; Hope Estate levee, approximate number of cu. yds. 3,200. The G. W. Gary Contracting Co. bid 25 cts. Cottage levee, approximate number of cu. yds., 5,300. G. W. Gary Contracting Co., 20 cts.; Conrad Point, levee, approximate number of cu. yds., 7,900. G. W. Gary Contracting Co., 20 cts. Martinez levee, approximate number of cu. yds., 1,000. G. W. Gary Contracting Co., 25 cts. In Iberville parish, Plaquemine Point levee, approximate cu. yds., 4,800. Felus L. Rhodes, 28 cts.

TOO LATE FOR CLASSIFICATION

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
STREETS AND ROADS.				
Ill.	Quincy	Sept. 18.	Paving with brick and reinforced concrete.	Board of Public Works.
Pa.	Arnold	8 p.m., Sept. 18.	4,500 ft. concr. curb and gut. and 15,000 cu. yds. grading.	B. S. Dinsmore, Boro Engr., New Kensington, Pa.
Cal.	Sacramento	11 a.m., Sept. 19.	Improving streets and alleys.	M. J. Desmond, City Clerk.
N. J.	New Pr'y'd'ce.	8:30 p.m., Sept. 19.	Constructing concrete sidewalks.	W. J. Kauffman, Boro Engr.
Fla.	Tampa	10 a.m., Sept. 19.	1,000 cu. yds. oyster shells.	W. P. Culbreath, Clerk.
Ky.	Louisville	2 p.m., Sept. 20.	Paving 8 blocks with brick.	Board of Public Works.
Mo.	Trenton	Sept. 20.	Grading and constructing concrete walks.	M. H. Mooney, City Engineer.
O.	Coshocton	Sept. 21.	13,000 sq. yds. brick pavement.	Sam Ashman, Serv. Saf. Dir.
Texas	Dallas	10 a.m., Sept. 21.	Grading approach to viaduct.	J. F. Witt, Co. Engineer.
Ind.	Indianapolis	10 a.m., Sept. 21.	Constr. curbs, concr. walks and retaining wall.	Board of Park Commissioners.
Ind.	Indianapolis	10 a.m., Sept. 22.	Paving Roanoke Street	B. J. T. Jeup, City Engineer.
N. Y.	New Brighton	noon, Sept. 22.	3,400 sq. yds. granite block pavements, curbs, etc.	Engr., Bur. of Engineering.
O.	Marion	noon, Sept. 23.	Repairing and resurfacing road.	V. P. Garfield, Clk., Co. Comm.
Ind.	Indianapolis	10 a.m., Sept. 25.	Paving Kentucky Street	B. J. T. Jeup, City Engineer.
N. Y.	Buffalo	noon, Sept. 26.	Repairing park roads	J. F. Malone, Comr. of Parks and Buildings.
Ariz.	Tucson	10 a.m., Sept. 26.	Improving 17.8 miles road	Board of Supervisors.
Ind.	Indianapolis	10 a.m., Sept. 27.	Paving several streets	B. J. T. Jeup, City Engineer.
Ind.	Vincennes	2 p.m., Oct. 3.	Constructing 27,000 ft. gravel road.	J. I. Muentzer, Co. Aud.
Ind.	Martinsville	1:30 p.m., Oct. 3.	Constructing gravel roads	Sam Watson, Co. Auditor.
Ind.	Bloomfield	2 p.m., Oct. 3.	Constructing macadam roads	G. E. Kidd, Co. Auditor.
Ind.	Corydon	2 p.m., Oct. 3.	Gravel or macadam road	J. L. O'Bannon, Co. Aud.
Ind.	LaPorte	10 a.m., Oct. 5.	Constructing several roads	F. A. Hausheer, Co. Aud.
SEWERAGE.				
Pa.	Pittston	8 p.m., Sept. 18.	Constructing trunk sewer	City Engineer.
O.	Zanesville	Sept. 20.	Extending Cedar avenue sewer.	Director of Public Service.
WATER SUPPLY.				
La.	Lafayette	Sept. 21.	200 h. p. oil engine and 150 k.v.a. generator for water and light plant	J. O. Herpin, Trus., Pub. Prop.
Pa.	Tarentum	7 p.m., Sept. 21.	Concrete coagulating basin	Boro Engineer.
Ky.	Louisville	2 p.m., Sept. 22.	Erecting fire hydrants	Board of Public Works.
MISCELLANEOUS.				
Ia.	Hampton	Sept. 22.	Constructing drainage ditches.	Frank McSpaden, Co. Aud.
N. Y.	Watertown	5 p.m., Sept. 25.	Collecting garbage for one year.	E. W. Clark, City Clerk.

STREETS AND ROADS

Fort Smith, Ark.—The City National bank has purchased Sixth St. improvement district bonds amounting to \$16,000.

Los Angeles, Cal.—Several streets are to be improved.

Redding, Cal.—All bids for grading the 6,160 ft. of the Ono road near the Clear Creek bridge have been rejected by the Supervisors. They will be opened again on the first coming month.

Wilmington, Del.—Board of county commissioners of Chester county, Pa., has decided to improve the West Chester and Wilmington state road between Darlington's Corner and Dilworth town. State department will appropriate about \$8,000. Commissioners decided to appropriate \$1,500.

Arcadia, Fla.—An election will be held in October to vote on issuance of road bonds.

Tampa, Fla.—Neither the "Bayshore" nor the "Eastern" road is to be built.

Tampa, Fla.—G. B. Sawyer & Co., Jacksonville, have purchased road and bridge bonds amounting to \$164,000.

Auburn, Ind.—No bids were submitted to De Kalb county commissioners for a gravel road in Franklin township. The road was advertised for letting Sept. 6.

Brazil, Ind.—No bids have been filed on the W. H. Nolting road on the Posey and Perry township line, or on the W. H. Lankford road in Washington township.

Corydon, Ind.—Harrison county failed to receive any bids for a macadam road advertised for letting on Sept. 7.

English, Ind.—Oct. 2, 1916, at 2 p. m., by Treasurer of Crawford county, for sale \$3,000 highway improvement bonds, 4½ per cent., ten years. A. H. Flanagan, Treasurer.

La Porte, Ind.—Sept. 20, 1916, at 10 a. m., by Treasurer of La Porte county,

for sale \$19,600, \$8,800, \$2,400, \$2,400 and \$3,700 highway improvement bonds, 4½ per cent., ten years. Carl Fusch, Treasurer.

Napoleon, Ind.—Seasongood & Mayer, Cincinnati, have purchased road bonds amounting to \$78,000.

Newport, Ind.—Sept. 26, 1916, at 10 a. m., by Treasurer of Vermillion county, for sale \$7,500 highway improvement bonds, 4½ per cent., ten years. J. Clark Smith, Treasurer.

Rensselaer, Ind.—Sept. 20, 1916, at 1 p. m., by Treasurer of Jasper county, for sale \$5,600 and \$7,600 highway improvement bonds, 4½ per cent., ten years. Charles V. May, Treasurer.

Rushville, Ind.—Sept. 22, 1916, at 2 p. m., by Treasurer of Rush county, for sale \$16,600 highway improvement bonds, 4½ per cent., ten years. John O. Williams, Treasurer.

Shelbyville, Ind.—Sept. 23, 1916, at 10 a. m., by Treasurer of Shelby county, for sale \$25,600 highway improvement bonds, 4½ per cent., ten years. S. A. Brown, Treasurer.

Vincennes, Ind.—No bids were received for 3 miles gravel road. J. Muentzer, Auditor.

Oelwein, Ia.—The city engineer has been instructed to repair paving on West Charles St. at Second Ave.

Lawrence, Kan.—An ordinance has been passed ordering the paving of Elm St., part of which will be done immediately.

Henderson, Ky.—The council plans to build a river roadway from Fifth St. through Atkinson Park, a distance of two miles.

Hickman, Ky.—City council is contemplating a bond issue of \$20,000 or \$25,000 for street improvements and drainage. It will be voted on at the November election.

Louisville, Ky.—City council has passed ordinances providing for improvement of streets and sidewalks.

Lafayette, La.—A bond issue of \$300,000 to be voted on before Jan. 1 is under consideration for the construction of good roads.

Fitchburg, Mass.—Commissioner of streets and engineering recommends a sidewalk on Putnam St.

Salem, Mass.—The city Council have passed the order appropriating \$75,000 for the Bridge St. resurfacing.

Marquette, Mich.—The committee on highways and bridges have asked for an appropriation of \$6,000 to be used for the elimination of "Dead Man's Curve" on the county road between Marquette and Negaunee.

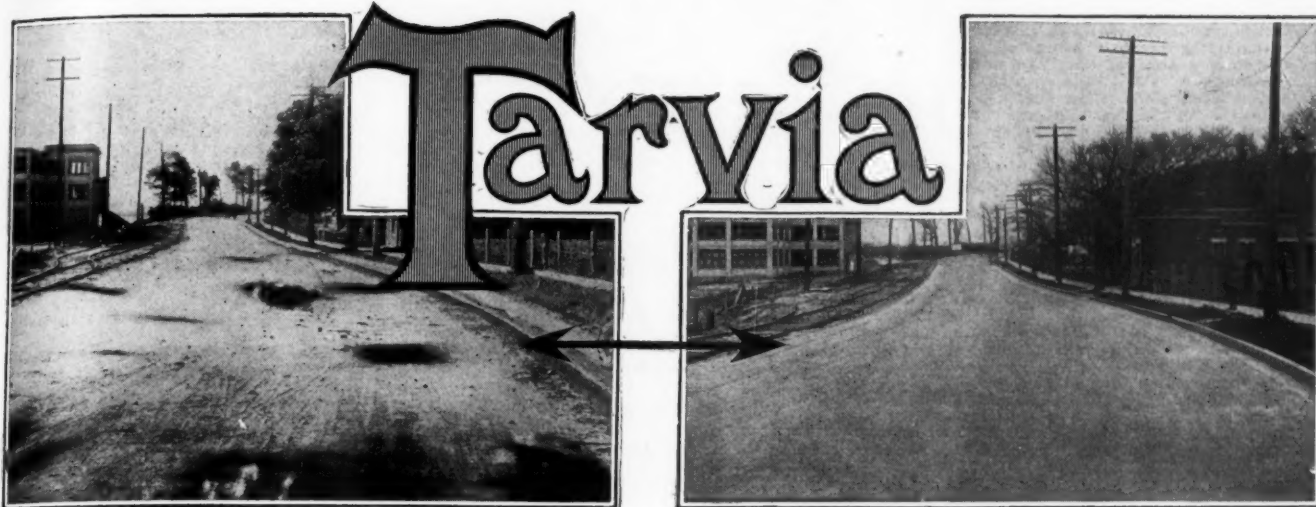
Petoskey, Mich.—Plans are completed for the paving to be done in this city in 1917 and call for concrete pavement from the city limits on the Grand Rapids to Mackinaw pike route to the heart of the city. Address City Engineer.

Billings, Mont.—Whether the city shall construct approximately 1,800 ft. of temporary board walks, 3 ft. wide, from the east end of the present walk on First Ave. north to the city limits, providing the county finishes the construction of the walk to the county fair grounds, is a question that was being debated by the city council.

Morristown, N. J.—M. M. Freeman Co., Philadelphia, Pa., have purchased Morris county road bonds amounting to \$543,000.

Albany, N. Y.—An ordinance is pending before the common council authorizing and directing the laying of concrete walks on Delaware Ave. from Secrete walks on Delaware Ave. from Secrete Ave. to the former south line of the city; also the laying of a concrete walk on the west side of Swan St. from Colombe St. to Van Woert St.

Hoosick Falls, N. Y.—Under the supervision of Superintendent of Highways Hall a gravel top is being constructed on the highway leading over the hill road to Hoosick. The road was recently worked with the new road making ma-



Arthur Street, Manistee, Mich., before and after the use of "Tarvia-X" mixed macadam

What Manistee did with Tarvia

MANISTEE, Mich., is a "Tarvia town"; that is to say, it has settled down to a regular policy of using Tarvia for the maintenance of its macadam roads.

It has learned, as other towns have learned, that the cheapest way to maintain macadam under modern conditions is to bond the stone with Tarvia.

As a result of this policy extending over nine years, Manistee has many miles of beautiful smooth pavements.

Notice from this record of sales how the tarviated areas have been extended year by year.

In 1907.....	2,500 gallons
1908.....	4,800 gallons
1909.....	3,000 gallons
1910.....	14,000 gallons
1911.....	21,000 gallons
1912.....	18,000 gallons
1913.....	9,000 gallons
1914.....	34,000 gallons
1915.....	32,000 gallons

Manistee makes use of all three kinds of Tarvia. It has used "Tarvia-B" for surface work and dust suppression, "Tarvia-A" for resurfacing operations and "Tarvia-X" for road building.

Hundreds of other towns throughout the country have found Tarvia the most satisfactory and economical answer to their road problems.

Illustrated booklet describing the treatments on request

Special Service Department

This company has a corps of trained engineers and chemists who have given years of study to modern road problems. The advice of these men may be had for the asking by anyone interested.

If you will write to the nearest office regarding road problems and conditions in your vicinity, the matter will have prompt attention.

The *Barrett* Company

New York Chicago Philadelphia Boston St. Louis Cleveland Cincinnati Pittsburgh Detroit
Birmingham Kansas City Minneapolis Nashville Salt Lake City Seattle Peoria

THE PATERSON MANUFACTURING COMPANY, Limited: Montreal, Toronto, Winnipeg, Vancouver, St. John, N. B., Halifax, N. S., Sydney, N. S.



chinery of the town. The town board will meet soon when it is expected matters relating to the purchase and use of the new machinery will be considered.

Syracuse, N. Y.—Plans are being made to raise Hiawatha Ave.

Raleigh, N. C.—An asphalt road to be constructed from Raleigh to Durham is advocated.

Niles, O.—Several streets are to be improved.

Eugene, Ore.—The single bid for the construction of over a mile of macadam road between the Hayden bridge and Springfield has been rejected as too high.

Salem, Ore.—The Oregon State Highway Department will begin at once to outline a five-year plan of road construction in the state which will be submitted to the United States Department of Agriculture in order to comply with Secretary Houston's ruling as to expenditures under the Shackleford bill.

Pittsburgh, Pa.—Brown's Hill road, a street owned solely by the county, but lying entirely within the city limits, extending from Hazelwood Ave. to Brown's Bridge, which crosses the Monongahela River at Glenwood, will have to be rebuilt by the county at an expense of from \$90,000 to \$160,000. The street is 60 ft. wide and 4,600 ft. long.

Dallas, Tex.—Oak Lawn Ave. is to be paved.

Quitman, Wood Co., Tex.—The Commissioners' Court has ordered a special election in good roads district No. 6 for the purpose of voting on a special bond issue of \$150,000. The plan is to build a hard surface road from Quitman to Mineola, a distance of ten miles, and

from Mineola to Hawkins. In all they plan to build about 35 miles of road.

Terrell, Tex.—An effort is being made to secure contributions for improving road between Terrell and Quinlan.

Janesville, Wis.—It is proposed to build about 150 miles of road at a cost of \$2,000 per mile. Oneida county will vote on a proposition to bond county the sum of \$300,000 to build roads to adjoining county lines.

Janesville, Wis.—Citizens are much interested in the Janesville-Beloit concrete highway; the county must raise \$60,000 toward its construction.

Kenosha, Wis.—Proposed bond issue for proposed \$90,000 has been turned down. Pleasant Prairie may issue bonds amounting to \$45,000 for roads.

BIDS RECEIVED AND CONTRACTS AWARDED.

(*Indicates Contracts Awarded.)

Montgomery, Ala.—*Jordan & Phillips, Snow Hill, at \$24,500 for eight miles of gravel road.

Gila, Ariz.—Following bids received on 68,000 sq. yds. 5-in. concrete pavement and 26,000 cu. yds. base rock excavation: Tri-State Concrete Co., El Paso, 76 cts. per sq. yd. for pavement and 42 cts. for excavation, total bid \$56,000; Bent Bros., Los Angeles, Cal., 68½ cts. for paving and 82 cts. for excavation, total \$64,000; Wessner & Rice, Los Angeles, Cal., 89½ cts. for paving and 50 cts. for excavation, total \$69,400; Michaelson & Barclay, Globe, Ariz., 95 cts. and 80 cts., total \$85,200.

Arcadia, Fla.—Bids received on water works extension and sewer extension.

		Water Extension							
		1	2	3	4				
22,800 lin. ft. 6-in. c.i. pipe, inc. specials.	\$0.74	\$16,872.00	\$0.77½	\$17,670.00	\$0.85	\$14,380.00			
14 connections to old mains.....	5.00	70.00	8.00	112.00	5.00	70.00			
46 hydrants complete	27.50	1,265.00	25.00	1,150.00	45.00	2,070.00			
6-in. gate valves—30	22.00	660.00	17.00	510.00	20.00	600.00			
Totals		\$18,867.00		\$19,442.00		\$22,120.00			
Time		90 days		100 days		8 mo.			
		Sewer Extension							
6,265 ft. 12-in. sewer pipe	\$1.30	\$8,144.50		\$0.88	\$5,513.20	\$1.70	\$10,650.50		
1,780 ft. 10-in. sewer pipe .....	.80	1,424.00		.82	1,459.60	1.20	2,136.00		
17,955 ft. 8-in. sewer pipe .....	.46	8,259.30		.58	10,413.90	.35	11,670.75		
6,000 ft. 6-in. sewer pipe .....	.32	1,920.00		.50	3,000.00	.30	1,800.00		
100 ft. 12-in. c.i. pipe	3.00	300.00		1.75	175.00	.60	160.00		
50 ft. 8-in. c.i. pipe	1.50	75.00		1.55	77.50	1.00	50.00		
52 manholes	50.00	2,600.00		50.00	2,600.00	48.00	2,496.00		
14 flush tanks	60.00	840.00		63.00	882.00	1.25	1,750.00		
Totals		\$23,562.80			\$24,121.20		\$30,713.25		
Time		120 days			120 days		8 mo.		
		Water Extension							
		5	6	7	8				
22,800 lin. ft. 6-in. c.i. pipe, inc. specials.			\$0.96	\$21,888.00	\$0.81	\$18,468.00	\$0.92½	\$21,090.00	
14 connections to old mains.....				8.00	42.00	1.00	14.00		
46 hydrants complete			25.85	1,189.10	26.00	1,196.00	30.00	1,380.00	
6-in. gate valves—30			15.60	468.00	18.00	540.00	25.00	750.00	
Totals				\$23,545.10		\$20,246.00		\$23,234.00	
Time				Nov. 1, 1917		40 days		60 days	
		Sewer Extension							
6,265 ft. 12-in. sewer pipe	\$1.50	\$9,397.50		\$1.41	\$8,833.65				
1,780 ft. 10-in. sewer pipe	1.00	1,780.00		.58	1,032.40				
17,955 ft. 8-in. sewer pipe .....	.72	12,927.60		.61	10,952.55				
6,000 ft. 6-in. sewer pipe .....	.37	2,220.00		.35	2,100.00				
100 ft. 12-in. c.i. pipe	3.00	300.00		1.50	150.00				
50 ft. 8-in. c.i. pipe	2.00	100.00		1.00	50.00				
52 manholes	50.00	2,600.00		35.00	1,820.00				
14 flush tanks	60.00	840.00		55.00	770.00				
Totals		\$30,165.10			\$25,708.60				
Time		6 mo.			140 days				
		Water Extension							
		9	10	11	12				
22,800 lin. ft. 6-in. c.i. pipe, inc. specials.	\$0.74	\$16,872.00		\$0.79	\$18,012.00	\$0.97	\$22,116.00		
14 connections to old mains.....	7.50	105.00		2.00	28.00	4.00	56.00		
46 hydrants complete	30.00	1,380.00		27.50	1,265.00	32.00	1,472.00		
6-in. gate valves—30	15.00	450.00		20.00	600.00	22.00	660.00		
Totals		\$18,807.00			\$19,905.00		\$24,304.00		
Time		Nov. 1, 1916			60 days				
		Sewer Extension							
6,265 ft. 12-in. sewer pipe	\$0.76	\$4,761.40	\$1.05	\$6,578.25	\$1.33	\$8,332.45	\$1.35	\$8,457.75	
1,780 ft. 10-in. sewer pipe .....	.59	1,050.20	.75	1,335.00	.61	1,085.80	.85	1,513.00	
17,955 ft. 8-in. sewer pipe .....	.54	9,695.70	.42	7,541.10	.54	9,695.70	.75	13,466.25	
6,000 ft. 6-in. sewer pipe .....	.22	1,320.00	.25	1,500.00	.23	1,380.00	.35	2,100.00	
100 ft. 12-in. c.i. pipe	3.00	300.00	1.75	175.00	2.20	220.00	1.90	190.00	
50 ft. 8-in. c.i. pipe	2.50	125.00	1.50	75.00	1.40	70.00	1.10	55.00	
52 manholes	35.00	1,820.00	41.00	2,132.00	30.00	1,560.00	45.50	2,366.00	
14 flush tanks	68.00	952.00	69.00	966.00	70.00	980.00	67.50	945.00	
Totals		\$20,024.30		\$20,302.35		\$23,323.95		\$29,093.00	
Time		Dec. 1, 1916		100 days		120 days			

1—Davis & Webb; 2—F. S. Perham; 3—Cornwall Construction Co.; 4—Benj. Thompson; 5—J. C. McNeill; 6—E. T. Smith Hardware Co.; 7—Dysard Construction Co.; 8—Mabry & Owens; 9—Florida National Vault Co.; 10—A. E. Perry; 11—Michler & Flynn; 12—Frank J. Stamm. Cravens & Kimmel, Engineers, Arcadia, Fla.